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HANSFORD (C. G.). **Annual Report of the Mycologist.**—*Ann. Rept. Dept. of Agric. Uganda, for the year ended 31 December, 1930* (Part II), pp. 58–65, 2 graphs, 1931.

In this report [cf. *R.A.M.*, x, p. 297] the author states that during the 1929–30 season the internal boll disease of cotton caused by *Nematospora gossypii* [ibid., xi, p. 42] appeared to be of considerable importance in the Teso district of Uganda. In the district of Buganda a peculiar disease (known among the natives as 'kigabi') was common on cotton in 1930–1: the leaves on individual, apparently healthy plants suddenly wilted, developed brown spots between their main veins, and were shed, most of the plants affected being killed during the dry months of January and February. The wood of the diseased stems contained discoloured lines from which a species of *Fusarium* was isolated, the pathogenicity of which is, however, doubtful, since inoculations with it gave no positive results. There was no evidence of the spread of the disease from plant to plant in the field.

Among the other plant diseases recorded in 1930 in Uganda the following may be mentioned: *Gibberella saubinetii* causing a rot of maize cobs; *Cercospora sesami* on sesame [ibid., viii, p. 200]; *Helminthosporium leucostylum* causing a leaf blight of *Eleusine coracana* [ibid., x, p. 437]; *Alternaria solani* on potatoes; and *F. moniliforme* [*G. moniliformis*] causing a tip rot of banana fruits.

In the district of Toro the seeds inside apparently normal coffee berries were found to be shrivelled and discoloured, and to contain *Nematospora coryli*. This condition, which had not been previously reported locally, is stated to be identical with that described by Wallace from Tanganyika [ibid., x, p. 453]. The insect carrier (*Antestia* sp.) was very prevalent in Toro, and its suppression appears to be the only feasible means for the control of the disease.

In Appendix I [which is reprinted in the *Empire Cotton Growing Review*, ix, 1, pp. 21–31, 1932] to this Report, dealing with the black arm disease (*Bacterium malvacearum*) of cotton [*R.A.M.*, xi, p. 176] in Uganda, it is stated that during the 1928–9 season the disease was very severe in the northern and eastern parts of the Teso district; in the next season it caused a great loss of crop over the whole of the most important cotton-producing parts of the Eastern Province. For the 1930–1 season seed was imported from

comparatively disease-free areas, but in spite of this an appreciable amount of leaf infection was observed throughout the Teso district, in a few cases with stem infection also. During the fruiting stage of the crop the infection gradually died out, and a normal, comparatively clean crop was obtained.

Inoculations showed that spraying the cotton plants with *Bact. malvacearum* only produced the leaf spot form and that only under special environmental conditions, among which a high humidity is the most important. No infection on uninjured stems or branches, or on the boll surface was obtained under experimental conditions, but when the surface was damaged infection readily occurred on any aerial organ of the plant. Over 75 per cent. of the black arm lesions observed in the field had obviously started at the junction of the petiole with the stem, spreading downward through the cortex and phloem from infected leaves. The type of leaf spot most frequently followed by petiole infection is one more or less involving the main veins. The presence of the bacteria in the petioles is visible macroscopically, and gives a translucent appearance to the tissues. So far no evidence has been found in Uganda in support of Massey's theory of the systemic infection of the host by *Bact. malvacearum* [ibid., viii, p. 568], and all the indications are that under Uganda conditions seed infection is limited to the exterior of the seed.

Observations during the 1930–1 season indicated that plants growing on poor soil were very susceptible to the black arm form of the disease, the stems being often completely ringed and breaking off. On more robust plants on better quality soil the lesions formed during wet weather rapidly dried out on the return of drier conditions, and were cut off by cork layers. It was also shown that if the top of the subsoil is wet when the cotton seedling roots reach it, these can penetrate it, and a reasonable freedom of the crop from disease may be anticipated.

THOMPSON (A.). **Division of Mycology. Annual Report for 1930.** —*Dept. of Agric. Straits Settlements and Fed. Malay States Technical Reports for the year 1930, Bull.* 6, *Gen. Ser.*, pp. 65–75, 1931.

In addition to information already noticed from other sources [cf. *R.A.M.*, x, p. 309; xi, p. 105] this report contains the following items of phytopathological interest. *Marasmius palmivorus* [ibid., viii, p. 305] was very prevalent on oil palms [*Elaeis guineensis*] during the wet season, but the only injury caused was on ripe fruits, in which part of the pericarp was rotted. Eggplants were attacked by the fruit rot due to *Vermicularia capsici* and by a leaf disease due to a *Cercospora*, the former fungus also causing a tomato fruit rot. A wilt of zinnias was due to *Pythium aphanidermatum* [ibid., ix, p. 89].

MANNS (T. F.) & ADAMS (J. F.). **Department of Plant Pathology.** —*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1931* (*Bull.* 172), pp. 42–51, 1931.

During the period under review attempts were made to transmit peach yellows and little peach [*R.A.M.*, x, p. 364] by the pollen, but

with negative results. Experiments to determine whether the absorption of copper salts by growing cucurbit plants imparted disease resistance were also unsuccessful as the solutions applied were too strong and killed the plants.

In spraying tests against bacterial spot of peach [*Bacterium pruni*: ibid., x, p. 225] the following preparations were used: mercutox (equivalent to 2 per cent. mercuric chloride), colatox (2 per cent.), sanoseed (6·3 per cent.), KIK (4 per cent.), and B.P.R. (2 per cent.), their lethal dilutions against *Bact. pruni* being determined as 1 in 25,000, 10,000, 100,000, 100,000 and 10,000, respectively, and the dilutions used in spraying being 1 in 1,600, 800, 2,000, 800, and 400, respectively. Applications were made during May and June, 1930, while in the preceding September and October sanoseed and B.P.R. had been applied, to compare the efficiency of post-harvest treatments. The first foliage infection was observed on 21st May, 1930, and the first twig infection on 7th June, by which date general foliage infection had also developed. Isolations from terminal twigs of Elberta peach trees in September, 1930, (A) from trees showing no infection, (B) from trees with heavy foliage infection, and (C) from trees with foliage and canker infection, gave negative results except from one bud in series C. Cankers collected at the same time also failed to yield the organism. No relation between infection by the oriental peach moth [*Cydia molesta*] and the overwintering of *Bact. pruni* was established.

Rotted strawberry roots consistently showed the presence of a species of *Actinomyces* [cf. ibid., xi, p. 250].

MARTIN (W. H.). **Plant pathology.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930*, pp. 44–51, 235–254, 1930. [Received March, 1932.]

Further studies on the control of potato scab (*Actinomyces scabies*) and *Corticium* [*C. solani*: *R.A.M.*, x. p. 12] included the addition to fertilizers of mercurous chloride (calomel) and certain organic mercury compounds. The best result in the elimination of *A. scabies* was given by the use of 15 lb. mercurous chloride per acre, which yielded 91·2 per cent. clean tubers, compared with 46·7 per cent. on the plots receiving fertilizer alone. On the latter plots only 1·5 per cent. of the tubers were free from the sclerotia of *C. solani*, compared with 48 per cent. on those treated with mercurous chloride.

Out of 650 tomato seeds from plants infected by wilts (*Fusarium lycopersici* and *Verticillium* [*albo-atrum*]) and 450 with early blight (*Alternaria solani*), not a single one was found to carry the organism internally. Negative results were also given by cultures of 1,500 seeds from lots originating in diseased fields. Good control of bacterial canker of tomatoes (*Bacterium vesicatorium*) [ibid., x, p. 73] was given by immersion of the seed in water for one hour at 50° C., 30 minutes at 55°, or 15 at 60°.

For severe attacks of apple fruit spot (*Phoma* [*Mycosphaerella*] *pomi*) [ibid., x, p. 391] at least three applications of Bordeaux mixture (2–6–50 or 1–3–50) are necessary, 17 days, 4 weeks, and

10 weeks after petal fall. Copper-lime dusts are also effective as fungicides, but they caused burning of the fruit and foliage.

Phomopsis vexans, the cause of a fruit rot of eggplants [ibid., viii, p. 23], was found to be borne under the seed coats of seeds from badly decayed fruits. The organism was destroyed by 15 minutes' immersion of the seed in water at 55° or 30 minutes at 50°. Beet leaf spots (*Phoma betae* and *Cercospora betae*) were also well controlled by 30 minutes' immersion of the seed in water at 55°, which resulted in a yield of 118 bushels compared with 87 for an untreated section of a greenhouse.

Pepper [*Capsicum annuum*] seed selected from healthy, mosaic [ibid., xi, p. 226], and leaf rolled plants, respectively, was tested under field conditions for seed transmission of these diseases. A test of 216 plants from six healthy parents yielded 3·2 per cent. mosaic, compared with 25·4 per cent. for 264 plants from seven diseased parents. The progeny from two of the mosaic parents gave 60·4 and 72·2 per cent. disease, whereas 8·3 per cent. mosaic was the highest in any of the 'healthy' selections. A comparison of 180 plants each from five healthy and five leaf roll parents indicated that this condition is also seed-transmitted and at least partially controllable by careful selection of parent stock.

The immersion of gladiolus corms in mercuric chloride 1 in 1,000 plus 1 per cent. HCl for seven hours against the seed-borne diseases caused by *Septoria gladioli*, *Bacterium marginatum*, and *Fusarium oxysporum* [var.] *gladioli* gave 76·6 per cent. clean corms in three tests on three varieties, compared with 27·2 per cent. in the controls. This treatment, however, resulted in delayed germination and sometimes in the formation of brown, sunken areas on the corms. No injury followed the use of six ethyl mercury chloride compounds, which resulted in averages of 70·4 and 81 per cent. clean corms in two experiments, compared with 21·7 and 41·8 per cent. in the untreated checks.

Inoculation experiments on a number of species of *Rhododendron* showed that all were susceptible to three strains of *Phytophthora cinnamomi*, viz., the type strain from cinnamon, an isolation from *Persea* sp. in Porto Rico, and the New Jersey rhododendron strain [ibid., x, p. 12].

Botany.—*Forty-third Ann. Rept. Georgia Exper. Stat. for the year 1930*, pp. 27–29, 1930. [Received April, 1932.]

In connexion with the work of selection for resistance to tomato wilt (*Fusarium lycopersici*), which has now been in progress in Georgia for ten years [*R.A.M.*, x, p. 436], it is stated that no strains of the Globe variety are immune from the disease, nor do they appear to be increasing in resistance.

Negative results in the transmission of peach rosette were given by the injection of juice or the insertion of crushed leaves and twigs from diseased into healthy trees, as well as by rubbing the leaves and growing points of healthy trees with crushed leaves and twigs of infected ones. However, fragments of bark from rosetted trees grafted on to healthy ones were fully as effective as buds in the transmission of the disease [ibid., x, p. 601].

Report of the Alaska Agricultural Experiment Stations 1930. —48 pp., 12 figs., 1 graph, 1931.

The following items of phytopathological interest occur in this report. In an experiment made at the Sitka Station to determine the value of lime in the control of finger-and-toe of cabbage (*Plasmodiophora brassicae*), the application of 1 or 2 tons per acre failed to cause an appreciable improvement, but the disease was partially arrested by 4 tons per acre. Cauliflowers were an almost complete failure on account of this disease.

Potatoes at the Matanuska Station developed black heart [*R.A.M.*, ix, p. 669] in the propagating-houses; the White Bliss variety appears to be resistant to this disease.

Brown (Nellie A.) & Leonard (L. T.). **Is Bacterium tumefaciens a mutant or one of the pleomorphic forms of Bacillus radiobacter?**—Abs. in *Phytopath.*, xxii, 1, p. 5, 1932.

The possibility that *Bacterium tumefaciens* may be a mutant, a physiologic form, or a pleomorphic form of *Bacillus radiobacter* has been suggested by the frequent appearance of non-virulent colonies of *Bact. tumefaciens* on plates made from known crown gall tissue, various cultural resemblances between the two organisms, and the development of tumour-like excrescences on various hosts from which *B. radiobacter* was isolated and not *Bact. tumefaciens*, more especially the appearance of galls ¼ to 1 cm. across in less than a fortnight on uninoculated cut stems of cowpea kept in a moist chamber.

B. radiobacter was isolated from these cowpea tumours and inoculated into the same and other plants with negative results, except in the case of one strain which produced small tumours, 5 to 6 mm. across, on daisy [*Chrysanthemum frutescens*] stems.

Stapp (C.) & Bortels (H.). **Der Pflanzenkrebs und sein Erreger, Pseudomonas tumefaciens. II. Mitteilung: über den Lebenskreislauf von Pseudomonas tumefaciens.** [Crown gall of plants and its causal organism, *Pseudomonas tumefaciens*. Note II: on the life-cycle of *Pseudomonas tumefaciens*.]—*Zeitschr. für Parasitenkunde*, iv, 1, pp. 101–125, 23 figs., 1 diag., 1931.

A detailed account is given of the authors' investigations on the different phases in the life-cycle of *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, x, p. 778], with special reference to the formation and disintegration of 'bacterial stars'. This phenomenon can be observed in cultures on dilute carrot juice with the addition of iron and manganese salts (preferably in the form of 0·01 per cent. $FeSO_4.7H_2O$ and 0·01 per cent. of $MnSO_4.7H_2O$). The cohesion of the bacteria in 'stars' is effected by protoplasmic connexions between the single individuals, the 'stars' during this phase being embedded in a tough, ropy mucilage. The protoplasmic connexion can be readily seen after treatment with KOH and staining with methylene blue.

'Star' formation is thought to be in all probability a sexual process. The individual rods resume division after the 'stars' break up and the young forms resume motility.

No filterable stages of *Bact. tumefaciens* could be detected in the course of these studies.

RIVES (L.). **Sur le cancer végétal et le potassium.** [On crown gall of plants and potassium.]—*Comptes rendus Acad. d'Agric. de France*, xviii, 2, pp. 63–67, 1 fig., 1932.

In connexion with a current medical theory to the effect that predisposition to cancer in man is accentuated by a high potassium content of the tissues, the writer undertook a series of tests to determine the action (if any) of this mineral on the development of crown gall (*Bacterium tumefaciens*) in geraniums. Contrary to expectation, the plants receiving no potassium developed much the largest and most luxuriant tumours. This is tentatively attributed to the existence of a radio-physiological antagonism between potassium and *Bact. tumefaciens*, analogous to that between the salts of potassium and those of radium. Experiments (in collaboration with Dr. Olga Miletsky) at Toulouse also showed that the addition of potassium chloride (3 gm. per plant) does not favour the development of *Bact. tumefaciens*, whereas exceptional dimensions were reached by the tumours on plants receiving quicklime.

GASSNER (G.). **Neue Feststellungen über Auftreten und Verbreitung der Getreiderostarten in Südamerika.** [New facts concerning the occurrence and distribution of the cereal rust species in South America.]—*Phytopath. Zeitschr.*, iv, 2, pp. 189–203, 1 map, 1931.

During the author's travels in South America from September to December, 1927, the following observations on cereal rusts were made. *Puccinia graminis* was found on wheat at Campinas and elsewhere in San Paulo, Brazil, this being its northernmost record for South America. Rye was attacked by *P. dispersa* [*P. secalina*] and oats by *P. coronifera* [*P. lolii*]. In Paraguay wheat was infected by *P. graminis* and *P. triticina*, both the uredo and teleuto stages being observed, oats by *P. lolii* (mostly uredospores), and rye by *P. secalina*. Conditions were similar in Misiones [north-eastern Argentina]. Wheat in Uruguay was attacked by *P. graminis* and *P. triticina*, the former occurring also on barley and oats, the latter of which also showed constant infection by *P. lolii*. Rye was extensively infected by *P. secalina*. Both *P. graminis* and *P. triticina* were widespread in the northern wheat belt of Argentina [*R.A.M.*, x, p. 88], the former also attacking oats and a few scattered barley plants. Rye was infected by *P. secalina*. About 300 km. south of Buenos Aires there was a marked decline in the incidence of *P. graminis* and *P. lolii*, but not in that of *P. triticina* or *P. secalina*. Still further south (600 to 650 km. from Buenos Aires) only a trace of *P. graminis* was detected on the Record and Ideal wheat varieties, while *P. triticina* was not severe except on Kanred. South of Bahia Blanca, where the cultivation of cereals is limited by climatic factors, *P. triticina* was found to a moderate extent on wheat and *P. secalina* on rye. In south-east Brazil (near Porto Alegre) wheat was infected with extreme severity by *P. graminis*, which also caused heavy damage to oats and barley. Wheat, oats,

and rye in this area further showed extensive infection by *P. triticina*, *P. lolii*, and *P. secalina*, respectively.

P. glumarum was not observed by the writer on the occasion of his visit to South America, and it is evident, therefore, that its introduction into Argentina [ibid., x, p. 509; cf. also xi, p. 226] dates from between 1927 and 1929, probably 1928. The rust may possibly have been conveyed in the form of spores adhering to the the seed-grain, or it may have advanced inland from Chile (where it is reported to have been observed by Holway in 1919), crossing the mountain range of the Cordilleras.

Dodoff (D. N.). Устойчивость на нѣкои наши и чужди Пшеници спрямо седемь физиологически раси на **Puccinia triticina Erikss.** [Resistance of some Bulgarian and foreign Wheat varieties to seven physiological forms of *Puccinia triticina* Erikss.]—*Renseignements Agricoles*, Sofia, xii, 11–12, pp. 1–64, 10 figs., 1931. [English summary.]

This is a detailed account of the author's tests in the spring of 1931 of 192 varieties of wheat (including representatives of the five main groups of *Triticum*) of Bulgarian and foreign origin for resistance to the seven physiological forms of *Puccinia triticina* recently described from Bulgaria [*R.A.M.*, xi, p. 33]. The results [which are presented in tabular form] showed that the greatest resistance to all the 7 forms was exhibited by the einkorn (*T. monococcum*) group. The varieties of the emmer group (*T. dicoccum*) were characterized by the heterogeneous type of infection (type x) [ibid., ii, p. 159], the different parts of the same leaf showing various degrees of resistance. Resistance in these two groups of wheat was very uniform but not specific. The reaction of the durum wheats varied from high resistance in some varieties to high susceptibility in others, the resistance to the various physiological forms of *P. triticina* in most cases being very uniform. It was shown, however, that the varieties of this group vary widely in their reaction to infection, presumably in response to the influence of environmental factors, among which temperature is probably the most important; some varieties exhibited a higher degree of resistance in May than in March. In the *vulgare* group resistant varieties were very few: all the commercially valuable varieties proved to be very susceptible to all the seven physiological forms of rust. In the few cases where it was found, resistance was strictly specific and confined to some only of the forms.

The work also indicated that the seven Bulgarian physiological forms of *P. triticina* may be divided, on the ground of the reactions caused by them in the wheats studied, into two main groups, the first of which is represented by form XV and the second comprises forms XIII or XX and XXI. The pathogenicity of the forms of the second group was almost similar on all the wheat varieties and only differed on the variety Brevit C.I. 3778, the differences being noticeable only under certain environmental conditions. Form XXIV occupies a place intermediate between forms XIII or XX and form XXI, and forms XVII and XIX are intermediate between the two main groups, XVII being nearer XV and XIX nearer XIII (XX).

AAMODT (O. S.). **Varietal trials, physiologic specialization, and breeding spring Wheats for resistance to Tilletia tritici and T. levis.**—*Canadian Journ. of Res.*, v, 5, pp. 501–528, 13 graphs, 1931.

The investigation reported in detail in this paper was undertaken in the attempt to elicit the causes of the considerable increase, noticed of recent years, in the amount of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xi, p. 289] in western Canada, and also the possibility of controlling the disease by breeding resistant varieties of wheat. Varietal resistance tests of 149 varieties and selections of red spring wheats (*Triticum vulgare*) indicated that the increase in bunt may be accounted for in part by the introduction into western Canada of certain varieties, such as Kota, Ceres, Progress, Reward, and Red Bobs 222, that are more susceptible to bunt than some of the older varieties, e.g. Marquis. The tests also showed that the spring common wheats exhibit all gradations in reaction to bunt from apparent immunity to high susceptibility, and that, as a class, they are more susceptible to *T. foetens* and less susceptible to *T. caries* than the durum wheats; several new varieties, however, such as Kota, Ceres and Progress, are highly susceptible to both species of bunt. A number of varieties commonly grown in western Canada, such as Garnet and Ruby, are fairly resistant, but not sufficiently so as to render seed treatment unnecessary.

The inoculum used in the tests consisted of composite collections of smut spores grown on a number of wheat varieties, the indications being that this method is sufficiently reliable in determining the reaction of a variety to bunt. There was clear evidence of the existence of physiologic forms of the two species, the term physiologic form being used to design a spore collection purified by growth during two or three generations on pure host material, and capable of producing a definite set of reactions on a given group of differential varieties [a list of which is given]. In the course of the work one physiologic form of *T. caries* and five of *T. foetens* were obtained from six collections, but it is believed that a considerable number of forms could probably be distinguished with numerous collections and the proper differential hosts. Some of these physiologic forms appeared to vary in their infection capabilities at different temperatures.

The preliminary study of inheritance of resistance to bunt in the F_3 generation of crosses between parents of varying resistance or susceptibility showed that the average percentage infection of the F_3 lines was intermediate between that of the two parents in eight out of nine crosses; in the ninth cross the average percentage was greater in the F_3 line than in either of the parents. The reaction to wheat bunt appears to be governed by multiple factors, the exact nature of which has not yet been determined.

REICHERT (I.). **Tilletia tritici on Aegilops.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 133–135, 1931.

The author states that of 19 species of *Aegilops* tested in his artificial inoculation experiments with *Tilletia tritici* [*T. caries*]

from wheat in Palestine [*R.A.M.*, xi, p. 34], only one (*A. ventricosa*) was successfully infected with the spores of the smut.

FOËX (E.) & ROSELLA (E.). **Au sujet du problème du piétin du Blé.** [On the problem of the foot rot of Wheat.]—*ex* Travaux Cryptog. dédiés à L. Mangin, Muséum National d'Hist. Nat., Paris, pp. 294–302, 1 pl., 1931.

In continuation of their studies of the problem presented by the foot rot diseases of wheat in France [*R.A.M.*, x, p. 720], the authors give a brief description of the characters differentiating *Leptosphaeria herpotrichoides* from *Cercosporella herpotrichoides*, since these two organisms appear frequently to have been confused.

MORITZ (O.). **Entstehungsbedingungen und Verhütungsmöglichkeiten der Ophiobolose des Weizens. Vorläufige Mitteilung.** [Conditions of origin and possibilities of prevention of ophiobolosis of wheat. Preliminary note.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xi, 12, pp. 100–101, 1931.

Pursuing his studies on the factors governing the development of foot rot of wheat (*Ophiobolus*) [*graminis*] in Schleswig-Holstein [*R.A.M.*, x, p. 512], the writer observed a distinct connexion between the occurrence of the disease and the geological age of the soil. Foot rot is found only on the oldest podsol soils of the eastern and central districts, while the geologically recent western marshes and the island of Fehmarn (czernosen or black soils) are exempt from the disease. The physical structure of the soil is probably in part responsible for the presence or absence of foot rot, which was completely suppressed in recent pot experiments by kaolin, and also by the addition of charcoal to a peat and sand soil. Experiments on the lines of those conducted by Sanford and Broadfoot [ibid., x, p. 719] showed that the pathogenicity of *O. graminis* was greatly reduced by the admixture of non-sterile soil from any locality, especially from the uninfected districts, whereas sterile soil showed no such action. The non-sterile eastern soils and that from a field in which foot rot occurred in the previous summer also failed to cause any appreciable reduction in the virulence of the fungus. The biological condition of the soil is evidently of paramount importance in the etiology of foot rot, the association of which with chemical and physical factors requires further investigation.

SCHMIDT (E.) & TORNOW (E[LISABETH]). **Nachweis der Beizung von Getreide mit Quecksilber und anderen Metallgiften.** [Demonstration of the disinfection of cereals with mercury and other metallic poisons.]—*Fortschr. der Landw.*, vii, 2, pp. 40–42, 1932.

Full details are given of an electrolytic apparatus, supplied by Dr. Bender and Dr. Hobeim, Lindwurmstr., Munich, for the detection of mercury and other heavy metals in treated cereal seed-grain. Tests with this on rye and wheat seed-grain treated with uspulun-universal and germisan in 1927 showed that the mercury does not gradually disappear by volatilization as is often assumed.

WELSH (J. N.). **The inheritance of stem rust and smut reaction and lemma colour in Oats.**—*Scient. Agric.*, xii, 4, pp. 209–242, 1931.

This is a detailed account of the investigation at the Dominion Rust Research Laboratory, Winnipeg, of the inheritance of varietal resistance in oats to stem rust (*Puccinia graminis avenae*) [*R.A.M.*, x, pp. 176, 177], and to loose smut (*Ustilago avenae*) and covered smut (*U. levis*) [*U. kolleri*: cf. ibid., xi, p. 233]. In Canada the problem of breeding for resistance to all physiological forms of the rust is complicated by the existence there of form 6, to which all the oat varieties tested are susceptible; since, however, this form and the recently isolated virulent form 8 are comparatively rare under field conditions, and sufficient varietal resistance was found to all the other forms, it is considered that success may ultimately be attained on a field scale. Varietal reaction to the rust seems to be governed by a single factor, resistance being apparently dominant; the only exception was found in the reaction of the cross Heigira Strain with Joanette Strain to form 4, which appeared to be governed by two factors. No relationship was found to exist between reaction to the rust and such characters as maturity of the host and colour of the lemma.

The work indicated that oat strains resistant to both types of smut can be produced without much difficulty. A fairly high correlation was established between the amount of infection that developed in oat lines inoculated with both smuts, and transgressive segregation was observed in such lines. It was also shown that plants infected with the smuts are more susceptible to rust infection than non-smutted ones.

COFFMAN (F. A.), STANTON (T. R.), BAYLES (B. B.), WIEBE (G. A.), SMITH (R. W.), & TAPKE (V. F.). **Inheritance of resistance in Oats to Ustilago levis.**—*Journ. Agric. Res.*, xliii, 12, pp. 1085–1099, 1931.

This is a summarized report of the authors' study since 1925 of the inheritance of resistance to covered oat smut (*Ustilago levis*) [*U. kolleri*] in crosses between the highly resistant, if not entirely immune, oat variety Markton [*R.A.M.*, x, pp. 178, 721] and nine susceptible varieties [a list of which is given]. In the F_2 populations of seven of these crosses susceptible and heterozygous plants were predominant, while in the remaining two, in which the populations grown were small, the reverse was true. In three crosses approximately one-fourth of the progeny lines from F_2 individuals were free from smut, and in three other crosses the smut-free and infected progeny lines were almost equally divided. In the F_3 lines the gradation in the percentage of smut-infected plants was such as to preclude the classification of these progenies into genetic classes on this basis. Especially high correlation between infection percentages in the F_3 and F_4 was found in the crosses of Markton with Scottish Chief, and there was also evidence of such a correlation in three other crosses. Transgressive segregation for susceptibility was found in some of the F_4 progenies of the crosses with Markton as one parent and Scottish Chief or Swedish Select as the other. Little or no correlation was established between the mor-

phological characters of the oat varieties and relative resistance of their progeny to the smut.

The results of the work appear to disprove the existence in Markton of three factors for resistance to all the physiological strains of *U. kolleri*.

HUSKINS (C. L.). **Blindness or blast of Oats.**—*Scient. Agric.*, xii, 4, pp. 191–199, 1931.

The results of the author's biometrical study of blindness or blast [*R.A.M.*, viii, p. 303] in oats in Canada [details of which are given] lead him to consider that this condition is due to several different causes. There was an indication that good blast-resistant varieties of oats may be produced by breeding.

LUNDEGÅRDH (H.). **Studier over stråsädens näringsupptagande samt dettas betydelse för tillväxten och för uppkomsten av icke-parasitära sjukdomar.** [Studies on the nutrient absorption of cereal seed-grain, its importance for growth and for the development of non-parasitic diseases.]—*Centralanst. för försöksväsendet på jordbruksområdet Meddel.* 403, 146 pp., 4 figs., 29 graphs, 1931. [English summary.]

An exhaustive account, accompanied by 55 tables, is given of the author's studies, conducted in Sweden by spectroscopic methods, of the intake and distribution of cations in water and pot cultures chiefly of Seger, Dala, and Mesdag oats.

All factors causing a decrease in the manganese absorption of the plant, e.g., large quantities of lime, humus, or colloids, and the application of nitrate or alkaline phosphate fertilizers, were found to promote the occurrence of grey speck [*R.A.M.*, xi, p. 295]. The hydrogen-ion concentration is important, since it determines the availability of the manganese in the soil. In addition to manganese deficiency, a disturbed ion balance in the plant, especially extremely low or high values of the quotient potassium : calcium phosphate, appears to be a decisive factor in the development of grey speck.

CHRISTENSEN (J. J.). **Studies on the genetics of Ustilago zeae.** —*Phytopath. Zeitschr.*, iv, 2, pp. 129–188, 2 pl., 1931.

A very comprehensive and fully tabulated account is given of the author's continued researches on the genetics of maize smut (*Ustilago zeae*) [*R.A.M.*, ix, p. 713].

The fungus is predominantly heterothallic, but some monosporidial lines were found to be pathogenic when inoculated singly into maize plants. Segregation of the factors for sex, growth rate, and other cultural characters in the smut spores produced by these solo-pathogenic lines occurs in the promycelium, so that the sporidia are evidently bisexual. All solo-pathogenic lines are heterozygous for sex, but some are homozygous and others heterozygous for other characters. Nine different types of sexual grouping were obtained from individual chlamydospores [smut spores], the factors for cultural characters segregating independently of sex and of one another.

The solo-pathogenic lines resemble the unisexual lines in the

following characters: sporidial size and shape, colour range, growth rate, consistency of colonies, and tendency to sector, as well as in the microscopic details of the mycelium in culture. Solo-pathogenic lines are equally stable with unisexual ones; they do not lose their cultural peculiarities by passage through a living host, or their pathogenicity when reisolated from mycelium in the living host before spore formation. Such reisolations were made by infecting a leaf, removing the infected part after four to six days, surface disinfection, and incubating in a moist chamber, when aerial sporidia developed from the mycelium in the leaf. Solo-pathogenic lines, in fact, are distinguishable from unisexual ones only by inoculation tests. When the former are inoculated singly into maize, they develop a parasitic mycelium, produce anthocyan pigment, and form smut spores like two compatible unisexual lines. The mycelium of the solo-pathogenic and unisexual lines is often very irregular, contorted, and may be either uni- or multinucleate. Mature smut spores produced by solo-pathogenic monosporidial lines are of the same general shape and size as those formed by two unisexual lines of opposite sex, and they germinate normally.

Kovačevski (I. C.). Бактериалният листенъ пригоръ по Суданката и Метлата. [The bacterial leaf blight of Sudan Grass and Broomcorn.]—*Земледѣлска Мисъль* [*Agricultural Thought*], Sofia, ii, 3, pp. 51–64, 1 pl., 1931. [English summary.]

Sudan grass (*Andropogon sorghum* var. *sudanensis*), a recently introduced forage crop in Bulgaria, is stated to be severely affected over the whole country by a bacterial leaf spot [the symptoms of which are described] caused by an organism which is provisionally identified as *Bacterium holci* [*R.A.M.*, x, p. 238] in spite of a few minor differences, such as the frequent occurrence in the Bulgarian form of bipolar flagella and the fact that it coagulates milk before clearing it and does not reduce nitrates. The disease was also observed in nature on broomcorn (*A. sorghum* var. *technicus*), on which it is of no economic importance, and on Johnson grass (*A. halepensis*), a common and noxious weed in Bulgaria. The organism was experimentally shown to be pathogenic to dent and flint maize, but was not found on these hosts in nature. Preliminary experiments showed that the disease was not controlled by dipping the Sudan grass seed in 1 in 300 formaldehyde solution for 60 minutes, or by dusting it with granosan or semesan.

Although this is apparently the first record of *Bact. holci* in Europe, the author states that he found this organism in Bulgarian herbarium material of broomcorn dating from 1907. He also believes that careful study will show that the bacterial leaf spots of sorghum and Sudan grass described from south Russia, Italy, and Hungary and attributed to *Bacillus sorghi* [ibid., v, p. 741; viii, p. 753] are really caused by *Bact. holci*.

Rhoads (A. S.) & De Busk (E. F.). **Diseases of Citrus in Florida.** —*Florida Agric. Exper. Stat. Bull.* 229, 213 pp., 101 figs., 1931.

In this paper (a revision of Bulletin 150, 1918) descriptions are given of a number of fungous, bacterial, and physiological diseases

of citrus in Florida, with observations on their prevention by cultural measures and on the preparation and application of Bordeaux mixture, Bordeaux-oil emulsion, and lime-sulphur. Gummosis in Florida [*R.A.M.*, x, p. 727] is stated to be due to a number of causes, but the term is usually applied to a characteristic severe and often chronic disease on large bearing trees, the cause of which is unknown. Psorosis in Florida is considered to be undoubtedly due to an organism, but the latter is unknown. Florida scaly bark, termed leprosis by Fawcett and Lee [ibid., v, p. 735], is distinct from psorosis and is also found in Mexico, southern China, and the Philippines but has not been reported elsewhere. On the fruit this disease, the cause of which is unknown, is termed nail-head rust. It is confined almost exclusively to the sweet orange, whereas psorosis affects grapefruit and tangerines in addition. Fly speck due to *Leptothyrium pomi* is only occasionally found on citrus fruits in Florida, sometimes accompanied by sooty blotch due to *Gloeodes pomigena* [ibid., xi, p. 105].

RHOADS (A. S.). **Clitocybe mushroom root rot—a new disease of Citrus trees.**—Abs. in *Phytopath.*, xxii, 1, p. 23, 1932.

Some 150 citrus trees in Florida, including grapefruit, orange, and tangerine [*Citrus nobilis* var. *deliciosa*] on rough lemon rootstock, have been found suffering from an apparently long-standing root rot caused by *Clitocybe tabescens* [*R.A.M.*, x, p. 99].

BRIEN (R. M.). **Dormancy period of the Citrus bark-blotch organism.**—*New Zealand Journ. of Agric.*, xliii, 6, p. 421, 1931.

Continued observations since the publication of the author's recent paper on the pathogenicity of the bark-blotch fungus (*Ascochyta corticola*) of lemon trees in New Zealand [*R.A.M.*, x, p. 727] have shown that the organism may remain dormant for eleven to fifteen months after inoculation; on the onset of favourable conditions it is then capable of breaking out in a severe form, as exemplified on two trees of the Lisbon variety. This fact indicates that growers should continue to examine all the cankers treated at intervals over a period of at least 18 months, in order to ensure the success of the treatment.

SMITH (F. E. V.). **Stem end rot of Citrus fruits.**—*Journ. Jamaica Agric. Soc.*, xxv, 12, pp. 543–545, 1931.

After stating that investigations are in progress in Jamaica into the stem-end rot of citrus caused by *Diplodia natalensis* [*R.A.M.*, ix, p. 777] associated with a *Phomopsis*, and briefly describing in popular terms the manner and conditions in which infection occurs, the author emphasizes that the disease results directly from unsatisfactory cultural conditions in the citrus orchards. Care must constantly be taken to cut out and burn all the dead wood in order to eliminate as far as possible the main source of natural infection; the fruit should be picked in dry weather, not unduly wetted for a prolonged period after picking, and should be stored in a dry atmosphere.

After much experience of examining fruit in Jamaica in 1931 and

after inspecting for more than three months in 1929 samples entering Covent Garden from the island, the author concludes that the chief causes of loss in exported Jamaica citrus fruit are stem-end rot and blue-green mould [*Penicillium digitatum*].

TOMKINS (R. G.) & TROUT (S. A.). **The use of ammonia and ammonium salts for the prevention of green mould in Citrus.** —*Journ. Pomol. and Hort. Science*, ix, 4, pp. 257–264, 1931.

The experiments briefly described in this paper consisted in keeping oranges that had been inoculated through wounds with the green mould fungus (*Penicillium digitatum*) [*R.A.M.*, xi, p. 104] for periods from 7 to 73 days in large glass desiccators in the presence of various concentrations of ammonia in the air. At a temperature of 18° C. wastage due to the mould was considerably reduced by two and five parts of ammonia per 10,000, without impairing either the appearance or the flavour of the fruit; 10 parts per 10,000 caused slight damage to the skin of some fruit, while 20 parts did considerable damage in 15 days. The presence of ammonia in the air appeared, however, to favour the development of *Colletotrichum* [*? gloeosporioides*] spots after 21 days. At lower temperatures (3° and 10° C.) the green mould was almost completely controlled by one part ammonia per 10,000, but the fruit was less tolerant of the substance, since 3 parts caused damage to the skin immediately around the wounds, and in the presence of 10 to 12 parts the damage to the skin was general.

Comparable results were also obtained when ammonium bicarbonate was used instead of ammonia, or when a crystal of ammonium bicarbonate was enclosed in the wrappers around the oranges in a humid atmosphere; in dry air, however, the last method failed to give control. Subsidiary experiments indicated that ammonia may also be effective in the control of storage rots of grapes, but not of strawberries or raspberries.

HEWITT (J. L.). **Scaly bark. I. Favoured by soil and water conditions. II. Varies with seasons and groves and is controllable.**—*California Citrograph*, xvi, 12, pp. 547, 582–583; xvii, 1, pp. 17, 19, 32, 7 charts, 1931.

Data obtained in recent years from practical field experience in Orange County, California, lead to the following tentative conclusions concerning the incidence of psorosis of orange trees [see preceding page]. The heavier the soil the more it favours liability to the disease; excessive watering increases liability, though the water relation of psorosis is different from that of *Phytophthora* gummosis [*P. citrophthora*] or that of the so-called 'water injury' due to root rots; the condition is related to some atmospheric condition, probably moisture; and liability to infection varies annually. Following their inception, psorosis lesions become noticeable in from less than a year to about eighteen months. The Valencia orange is more susceptible than Navels, tangerines and grapefruit less so. Trees top-worked with limbs of one variety on a trunk of another variety or species are highly susceptible. Trees usually become liable to infection at 6 or 8 years of age, this liability increasing up to 15 or 20 years, and then decreasing. It is thought that the

disease may possibly have been recently introduced into Orange County.

HEWITT (J. L.). **Scaly bark treatment.**—*California Citrograph*, xvii, 2, pp. 54, 70, 1 fig., 1931.

The author considers that under the conditions prevailing in commercial groves in Orange County, California, the most effective treatment against psorosis of orange trees [*R.A.M.*, ix, p. 523 and preceding abstract] consists in Fawcett's standard scraping method [ibid., viii, p. 640], but there is at present no known method of preventing new infections.

The scraping should extend at least 6 inches above and below the lesion. Painting treated lesions does not, in the author's opinion, give greater control, but serves as a protection against infection by various organisms; a cheap, effective after-treatment consists in a 1 per cent. solution of potassium permanganate.

After a third-stage lesion [ibid., viii, p. 640] has been treated, and two years have elapsed for proper healing, there may be found spots exuding gum, or other evidence that the disease persists. If any hard scales are found to have developed, the spots should be re-scraped with a border of about one inch. It is inadvisable, however, to re-scrape an entire treated area unless extensive active disease is present.

Removal instead of treatment is indicated in the case of small limbs, extensive third-stage lesions, especially on entire trunks or numerous small branches, very susceptible trees, and those with many extensive third-stage lesions.

Under Orange County conditions it is probably safer to interrupt treatment when the trees are wet and when a desert wind is blowing; in other parts of California it is said to be safer not to treat just before severe cold.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1930–1931.**—*Mysore Coffee Exper. Stat. Bull.* 5, 24 pp., 1 pl., 1931.

Fomes lamaoensis [*R.A.M.*, xi, p. 72] is stated to be by far the most common cause of root disease of coffee in Mysore, and it was also constantly isolated from tea roots. Traces of the disease were observed on a young Robusta coffee plant from the collar to a depth of nine inches on the tap-root, while all the lateral roots arising in this region were infected up to a distance of four inches from their point of origin, except for two which showed infection for much longer distances from the tap-root and were found to be in direct contact with the roots of a neighbouring stump about 12 inches from the surface and 20 inches horizontally from the tap-root. The only known means of controlling root disease is by the eradication of rotting timber from the soil, and this is generally too expensive to be carried out on a large scale. The second most common source of root disease is a *Rosellinia*, probably *R. arcuata* [ibid., ix, p. 129].

A *Rhizoctonia* was isolated from the tissues of coffee seedlings in nursery beds during the early part of the monsoon. A leaf spot

due to *Cercospora* sp. is prevalent among young plants but readily yields to the application of Bordeaux mixture.

MAYNE (W. W.). **Seasonal periodicity of Coffee leaf disease (Hemileia vastatrix, B. & Br.). Second report.**—*Mysore Coffee Exper. Stat. Bull.* 6, 22 pp., 3 graphs, 1932.

Further investigations [the results of which are fully described and tabulated] on the seasonal periodicity of coffee leaf disease (*Hemileia vastatrix*) in Mysore [*R.A.M.*, xi, p. 41] confirmed, in all essential points, those of the previous year. A marked divergence was observed, however, in the time of maximum development of the disease, which occurred before the end of the south-west monsoon. This is attributed to the effects of shelter from the south-west monsoon winds facilitating the development of spores in the vicinity of initial infections. The early maximum is followed by a fall in percentage infection and then, in the unsprayed plots, by a secondary rise due to the infection of the new post-monsoon flush. Spraying was apparently much more effective in the control of leaf disease in 1929 than in 1930, the light and broken monsoon of the latter year evidently having been more favourable to the spread of *H. vastatrix* than the continuously wet corresponding period of the previous one. In most of the coffee-growing districts of South India two fungicidal treatments appear to be necessary for the control of leaf disease, though under certain conditions one may give satisfactory results.

MAYNE (W. W.). **Die back of Coffee.**—*Planters' Chron.*, xxvi, 21, pp. 492–495, 1931.

The type of die-back of coffee branches found in southern India and described in this paper causes the death of individual shoots, crop-bearing and non-cropping, the symptoms developing on the young wood and gradually affecting the whole shoot; except in very young plants, whole branch systems or primaries are not destroyed. The symptoms were invariably noted only on totally defoliated shoots, shoots with one, or rarely, two pairs of immature leaves, or leafy shoots which had lost the apical pair or couple of pairs of leaves.

Affected shoots first turn yellow, and then brown sunken areas appear, usually extending up and down from a leaf scar. These areas blacken and spread until the whole shoot becomes affected, leaving a dead, black stick. The blackened areas bear fungal pustules [*Colletotrichum coffeanum*: *R.A.M.*, iv, pp. 166, 591], cultures from which developed the perithecia of *Glomerella* [*cingulata*: loc. cit.].

In southern India die-back of coffee occurs at three main periods: towards the end of the monsoon, after the crop, and in the hot weather; the first of which is correlated with attacks of leaf disease [*Hemileia vastatrix*] while the other two also occur during periods of physiological strain on the plant. It is considered that the condition is primarily due to physiological causes, the fungal attack being, to a great extent, secondary in character.

Defoliation alone was not found to be necessarily followed by die-back, but no differences in regard to starch content were found

which might explain why some defoliated shoots died back whereas others recovered. Nevertheless the prevention of defoliation checked die-back, as when leaf disease was controlled by spraying, and this practice, with attention to cultural measures directed to improving the general health of the bushes, are recommended for reducing the disease.

PICADO (C.). **Fusariose des Caféiers à Costa Rica.** [Fusariosis of Coffee bushes in Costa Rica.]—*Rev. Path. Vég. et Ent. Agric.*, xviii, 10, pp. 312–318, 3 figs., 1931.

A brief account is given of a disease of the coffee bush which is stated to have involved several hundred hectares of coffee plantations on the Pacific slopes of Costa Rica in 1931, following two years of severe drought. The disease, which apparently spreads in the direction of the prevailing winds, is characterized by a defoliation of the bushes or the death of the terminal buds and, in the cases when it develops at the beginning of the maturation of the coffee beans, by a die-back of the twigs and drying-up of the berries. The phloem tissues at the base of the stems show a brown discoloration which may extend in the form of streaks of varying width up to the twigs. The rootlets of affected bushes are disorganized and lesions also occur frequently on the main roots.

Isolations from diseased tissues yielded a species of *Fusarium* which on sugar-agar gave rise to pink or orange colonies bearing both microconidia (7 by 3 μ) and macroconidia (25 to 30 by 6 to 8 μ); both types of spores are also formed in sporodochia on the twigs of diseased coffee bushes in nature. In pure culture the fungus was shown to produce exodiastases which discoloured and killed living coffee twigs placed in a solution of them. The organism apparently kills the host cells in advance of its progress. Soil inoculation with pure cultures of the fungus transmitted the disease to healthy coffee plants and also to French beans (*Phaseolus vulgaris*) and broad beans (*Vicia faba*). Similar lesions to those on the coffee bushes were also found in nature on several leguminous species of plants (e.g., *Inga*, *Erythrina*, and *Gliricidia*), and isolations from them gave a fungus morphologically indistinguishable from the coffee one. The strain on *Inga* and *Gliricidia* developed the orange-red perithecia of a species of *Nectria* [cf. *R.A.M.*, ix, p. 229], measuring 270 μ in diameter; when cultured on the same media the ascospores produced a *Fusarium* presenting the same morphological and cultural characters as the coffee strain.

In nature this fungus was frequently associated with a species of Sphaeriaceae, with erumpent perithecia 170 μ in diameter, often containing over 36 asci with 8 hyaline and continuous spores each; pycnidia of this fungus were found in nature and were also produced in cultures from the ascospores. The pathogenicity of this organism to coffee was proved by artificial inoculation, but it is considered to be a weak parasite, capable of establishing itself only on debilitated plants. It is pointed out that conidia of the species of *Gloeosporium* and *Colletotrichum* that occur on coffee affected with anthracnose in Costa Rica give rise in pure culture to a form identical with that obtained from the ascospores of this species of Sphaeriaceae, which the author does not consider to be the same as

the *Glomerella* described by Small on coffee in Africa [*G. cingulata*: ibid., i, p. 5].

King (C. J.), Hope (C.), & Eaton (E. D.). **The Cotton root rot fungus indigenous in Arizona deserts.**—*Science*, N.S., lxxv, 1932, pp. 48–49, 1932.

The writers have been engaged on a study of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xi, p. 240] at Sacaton, Arizona, where large areas of desert land are being brought into cultivation in connexion with new irrigation projects. In 1931, extensive patches of spore mats of the root rot organism were found in a desert area. A profuse desert vegetation existed in this area, a high level plain near the mountains, twelve miles away from the nearest cultivated fields and quite separated from any of the general drainage water channels of the region. Additional spore mats were found in the same area beneath trees and other plants. Definite injury was found to have been caused by *P. omnivorum* on the roots of *Chamaesyce albomarginata, Aplopappus heterophyllus*, and *Sphaeralcea ambigua*, but no lesions or rotted tissues were observed on those of *Prosopis velutina, Condalia lycioides* var. *canescens*, and *Opuntia arbuscula*, which also bore the mycelium of the fungus. One of two sclerotia found in a soil sample from the vicinity of the spore mats germinated in the laboratory.

These observations seem to afford definite evidence that the cotton root rot fungus is indigenous in virgin lands in the south-western United States, and to explain the occasional occurrence of the disease in the first cultivated crops planted after clearing the native vegetation.

Neal (D. C.), Wester (R. E.), & Gunn (K. C.). **Treatment of Cotton root-rot with ammonia.**—*Science*, N.S., lxxv, 1935, pp. 139–140, 1932.

By experiments in the cultivation of the cotton root rot fungus (*Phymatotrichum omnivorum*) [see preceding abstract] in different media, ammonia has been ascertained to produce a toxic effect on this organism, which made only restricted growth in Duggar's solution with ammonium salts as the source of nitrogen. Both the mycelial and sclerotial stages of the fungus were killed by short exposure to the gas, and where dilute concentrations of the hydroxide were applied under field conditions, the organism was destroyed in the root tissues.

In culture experiments, ammonium nitrate and ammonium sulphate, used at a concentration to yield about 12·4 gm. nitrogen per l., permitted very little mycelial growth, whereas other sources of nitrogen allowed a profuse development.

The growth of *P. omnivorum* in flask cultures was also completely inhibited by 30 seconds' exposure to the gas generated from 500 c.c. of 28 per cent. ammonia water. The sclerotia of the fungus were destroyed by exposure to ammonia gas for 10 to 20 seconds.

Field tests have also been conducted at various times during the season to compare the efficacy of 6 per cent. solutions of ammonium hydroxide, formalin, and sodium hypochlorite applied to the soil

round the roots of infected cotton plants. After 40 hours the plants were removed from the soil and the roots placed in moist chambers, observations being made at one- and five-day intervals. The plants treated with ammonium hydroxide showed no mycelial growth; slight development was made by those treated with formalin, while sodium hypochlorite failed to prevent growth.

HOPKINS (J. C. F.). **Alternaria gossypina (Thüm.) comb. nov. causing a leaf spot and boll rot of Cotton.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 136–144, 1 pl., 7 figs., 1931.

An account is given of a leaf spot of common occurrence on cotton (chiefly of the American Upland type) in southern Rhodesia, the symptoms of which are almost identical with those described by Jones from Nigeria [*R.A.M.*, viii, p. 171], except for the eventual disappearance in the Rhodesian disease of the purple margin around the lesions possibly on account of environmental conditions or varietal differences of the host plants. Occasionally the disease was also observed on the immature bolls, but field observations indicate that infection of young bolls is rare in nature; the exposed lint of ripe bolls, however, is commonly found discoloured by the fungus.

Isolations from diseased material consistently yielded a species of *Alternaria* which in pure culture produced polymorphous, catenulate, dark brown, obclavate spores with up to nine transverse and usually one or two longitudinal septa, constricted at the septa, 32 to 46 by 12 to 15μ, and provided with a hyaline, sparsely septate beak 9 to 52μ long (giving a total length of 41 to 98μ). These characters agree well with Saccardo's description of *Macrosporium gossypinum* from cotton stems, if it is admitted that in the latter the beaks were omitted from the measurements, and the new binomial *A. gossypina* (Thüm.) is provisionally suggested for the Rhodesia fungus.

Typical lesions were produced on young growing leaves by spraying them with a suspension of the spores and by placing on their surface fragments of hyphae of the fungus. Uninjured four- and sixteen-day-old bolls failed to become infected by this means, but a boll rot developed when the surface of the bolls was scratched with a needle or when the inoculum was introduced into the interior of the bolls. All the infected fruits, even though completely disorganized by the rot, remained firmly attached to the plants up to the end of vegetation, this being apparently an hereditary character of the American Upland types of cotton grown in Rhodesia.

SAWYER (W. H.). **Studies on the morphology and development of an insect-destroying fungus, Entomophthora sphaerosperma.**—*Mycologia*, xxiii, 6, pp. 411–432, 2 pl., 1 fig., 1931.

A detailed and fully illustrated account is given of the life-cycle of *Entomophthora sphaerosperma* [*R.A.M.*, viii, p. 502] in artificial culture, all the phases of which were found to agree with those observed on larvae of *Rhopobota vacciniana* in nature. The spores are considered to be true conidia, and not monosporous sporangia as suggested by some observers. They are forcibly

detached and projected from the conidiophores by a definite mechanism, the chief part in which is played by a swelling of the conidiophore tip which is forced convexly into the spore base, followed by the circumferential rupture of the attachment and a recoil of the basal membrane of the spore. The latter is provided at its distal end with a gelatinous cap, which serves to attach it to the host or any other hard surface. A relative humidity of at least 70 per cent. is necessary for the germination of the conidia, the optimum temperature for which is near 20° C.; no germination was obtained at 26° or above, while low temperatures retarded but did not prevent it; freezing did not injure the conidia. No rhizoids were formed in pure culture. The work also indicated that the resting spores of *E. sphaerosperma* are formed asexually, and that their formation is controlled by certain factors such as temperature or special nutrient media. Contrary to Gilliatt's indications [ibid., v, p. 94], and although his experiments were repeated, the author failed in all his attempts to germinate the resting spores.

CHAUDHURI (H.). **Note on a Cordyceps from Tibet.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 203–205, 3 figs., 1931.

A brief description is given of four specimens of *Cordyceps sinensis* received by the author from Tibet. These *Cordyceps* heads are considered to be a valuable tonic medicine by the Tibetans and Chinese (the celebrated Chinese Plant Worm 'Hia Tsao Tchong').

In a note appended to this paper Mr. J. Ramsbottom gives an illustration of four bundles of this fungus recently received at the Natural History Museum, London, from northern China.

LAGERBERG (T.). **Smärre meddelanden. Hsia Tsao Tung Ch'ung.** [Shorter communications. Hsia Tsao Tung Ch'ung.]—*Svensk Bot. Tidskr.*, xxv, 4, pp. 543–545, 1 fig., 1931.

The author states that a specimen of *Cordyceps sinensis* [see preceding abstract] has been brought to Sweden from China by Dr. Hummel, and placed in the Swedish State Museum. He briefly reviews the various descriptions of these bodies given in European literature since they were first reported in 1726, and also the usages they are put to in China, where, he states, they are considered as a gastronomic delicacy, besides possessing medicinal value.

VUILLEMIN (P.). **Les champignons parasites et les mycoses de l'homme.** [Parasitic fungi and human mycoses.]—291 pp., 140 figs., Paris, P. Lechevalier & Fils, 1931.

This monograph of the fungi pathogenic to man and their effects is divided into two main sections, the first of which deals with the classification of the organisms, and the second with the etiology and symptomatology of the mycoses caused by them. A final chapter briefly discusses the therapeutics and prophylaxy of the

diseases, and the volume terminates with a systematic table of the parasites.

STOVALL (W. D.) & BUBOLZ (ANNA A.). **Cultural and biochemical characteristics of Monilia isolated from human sources.**—*Journ. Infect. Dis.*, l, 1, pp. 73–88, 3 figs., 1932.

For several years the writers have been engaged on a study of the species of *Monilia* isolated from cases of bronchitis, vaginitis, and thrush—150 in all—to which have lately been added 10 cultures from the American Type Culture Collection, viz., *M.* [*Candida*] *albicans*, *M. richmondi*, *M.* [*C.*] *pinoyi*, *M.* [*C.*] *metalondinensis*, *M. pseudotropicalis*, *M.* [*C.*] *krusei*, *M.* [*C.*] *tropicalis*, *M.* [*C.*] *macedoniensis*, *M.* [*C.*] sp. from sprue, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*] [*R.A.M.*, x, p. 790].

On the basis of morphology of the colonies, carbohydrate fermentation, and action on milk, all the cultures can be grouped into three species, namely, *C. albicans* (including *M. richmondi*, *C. psilosis*, *C. pinoyi*, *C. metalondinensis*, the unnamed form from sprue, and *M. pseudotropicalis*); *C. vulgaris* (*C. tropicalis*); and a third, apparently not represented among the cultures studied. This species (only five strains of which were isolated) regularly forms a distinct pellicle in the sugar broths that it ferments and should probably be transferred to the genus *Mycoderma*. It produces no gas in maltose or saccharose and does not coagulate milk. *C. albicans* was isolated six times as often as *C. vulgaris*, and is believed to have been frequently described under other names by investigators who failed to recognize it. The present studies indicated that the cultural and biochemical characters of these organisms are remarkably constant, so that their alleged variability may be due to irregularities of technique.

CATANEI (A.). **Observations sur les caractères de souches algériennes de champignons des teignes dans diverses conditions de culture et sur leurs altérations séniles ou pléomorphiques.** [Observations on the characters of Algerian strains of ringworm fungi under different cultural conditions and on their modifications due to senility or pleomorphism.]—*Arch. Inst. Pasteur d'Algérie*, ix, 3, pp. 451–469, 1931.

A full account is given of the writer's cultural studies on *Trichophyton album* [*R.A.M.*, x, pp. 106, 243], *T. pruinosum* [ibid., x, p. 664], *T. violaceum*, *T. crateriforme*, *Achorion schoenleini*, *T. acuminatum* [ibid., x, p. 457], and *T. radiolatum* on various media other than Sabouraud's, e.g., slices of potato and carrot, potato with the addition of glycerine, cereal grain, coagulated serum, and dextrin-agar. On wheat grain *T. album* formed spores measuring 4 to 4·5 by 2·5 to 3 μ. Pleomorphism of an irreversible type, as indicated by the development of white 'duvets' hitherto observed only in *T. acuminatum*, was found to be characteristic of a number of the other species examined. Inoculation experiments on guinea-pigs with pleomorphic cultures of *T. acuminatum* and *T. radiolatum* resulted in a more discrete type of infection than that associated with the original cultures.

Baudet (E. A. R. F.). **Les Trichophyton à culture faviforme sur milieux naturels et milieux à base de polysaccharides de Langeron et Milochevitch.** [Faviform species of *Trichophyton* on Langeron's and Milochevitch's natural media and media containing polysaccharides.]—*Ann. de Parasitol. Humaine et Comp.*, ix, 6, pp. 546–551, 2 pl., 2 figs., 1931.

On the ground of his experiments with four strains of a species of megasporic *Trichophyton* isolated from ringworm of bovines and closely resembling *T. album*, which on the usual media gave rise to faviform colonies but assumed a downy habit of growth on Langeron's and Milochevitch's natural media [*R.A.M.*, xi, p. 181, and preceding abstract], the author considers that the latter media are best adapted for the study of such organisms. The fungus developed especially well on barley grain, on which it produced the whole range of the usual fructifications.

Benham (Rhoda W.). **Phoma conidiogena, an excitant of asthma: some observations on the development and cultural characteristics.**—*Bull. Torrey Bot. Club*, lviii, 4, pp. 203–214, 3 pl., 8 figs., 1931.

A brief morphological and cultural account is given of a species of *Phoma* with an *Alternaria* stage in its life-history [cf. *R.A.M.*, i, p. 150], which was experimentally shown to cause an extremely severe attack of asthma in a patient predisposed to the complaint, when his throat was sprayed with an extract of the fungus, with simultaneous sensitization of the skin. The organism was identified as *Phoma conidiogena* Schnegg, with which *P. alternariaceum* (loc. cit.) and *Alternaria polymorpha* Planchon are thought to be possibly identical.

Boekhout (F. W. J.) & Van Beynum (J.). **Red spots on molded butter.**—*Versl. Landb. Onderzoek. Rijkslandbouwproefstat.*, xxxvi, pp. 5–14, 1930. (Dutch.) [Abs. in *Chem. Abstracts*, xxvi, 4, p. 1040, 1932.]

Epicoccum (? *heterochroum*) was found to be the cause of red spots on butter in Holland. The physiological reactions of the mould were studied.

White (R. P.). **Chloroses of the Rose.**—*Phytopath.*, xxii, 1, pp. 53–69, 5 figs., 1932.

A summary is given of recent literature on infectious chlorosis or mosaic of roses, from which it is apparent that this disease is widely distributed in the United States and Eastern Canada, affecting many varieties of Hybrid Tea, Hybrid Perpetual, Pernetiana, Hybrid Pernetiana, and Hybrid Wichuriana, as well as the species *Rosa manetti*, *R. multiflora*, and *R. odorata*, and the varieties Gloire des Rosomanes (Ragged Robin) and Texas Wax, all used as understocks [*R.A.M.*, x, p. 459; xi, p. 245]. A fairly extensive survey of rose stock and fields in France, Holland, and England in July, 1931, failed to reveal any cases of mosaic as it occurs in the United States, except on certain climbing varieties at Kew Gardens, which showed a veinal type of chlorosis, sometimes accompanied by slight speckling of the foliage. An amplified

description is given of the symptoms of rose mosaic, with special reference to the diverse forms assumed by the disease on different varieties, and some comparative observations are made on nutritional and insect chloroses.

GREEN (D. E.). **Further observations on the black spot disease of Roses (Diplocarpon rosae Wolf).**—*Journ. Roy. Hort. Soc.*, lvii, 1, pp. 58–62, 1 pl., 1932.

In connexion with the studies in progress at Wisley, Surrey, on the black spot disease of roses (*Diplocarpon rosae*) [*R.A.M.*, x, pp. 385, 793], data have been obtained from about 350 varieties which are here arranged in groups according to their reaction to the fungus, viz., almost free, and slight, medium, heavy, and variable infection. Juliet bushes sprayed in 1930 with 4-4-50 Bordeaux plus saponin (1 oz. to 50 galls.) [ibid., ix, pp. 195, 467] were markedly superior in 1931 to those left untreated.

JONES (L. K.) & HUBER (G. A.). **Verticillium wilt of Chrysanthemums.**—Abs. in *Phytopath.*, xxii, 1, pp. 14–15, 1932.

A species of *Verticillium* has been found causing 100 per cent. damage to certain varieties of greenhouse chrysanthemums in the State of Washington. Nineteen varieties [which are enumerated] have shown marked susceptibility to the disease, while 13 appear to be highly resistant. The causal organism seems to be carried in the cuttings taken from diseased plants of susceptible varieties, and control should therefore be based on the use of cuttings from healthy plants and on soil sterilization.

VOGLINO (P.). **Le macchie brune degli Astri della Cina.** [Brown spots of China Asters.]—*La Difesa delle Piante*, viii, 6, pp. 1–3, 1931.

After stating that in recent years China asters growing in commercial beds near Turin have been killed off during spring and autumn by *Fusarium* [*conglutinans* var.] *callistephi*, the author records that since 1928 and especially during 1930 a few individual plants in the same beds showed dwarfed branches and flowers and bore on the leaves, branches, and stems round or ellipsoidal, irregular, ochraceous-brown spots, 1 to 5 mm. in diameter, in which numerous erumpent black pycnidia developed. The latter were 150 to 200 μ in diameter and contained hyaline, elongated-elliptical spores, 6 to 8·5 (or occasionally 9) by 2·5 to 3 μ, borne on short hyaline basidia. The fungus is referred to *Phyllosticta asteris* Bresadola, previously reported only from Germany where it was observed by Sydow on living aster leaves. The parasitism of the fungus was confirmed by successful artificial inoculations of healthy, wounded asters in pots. The injury caused by it was negligible.

METCALFE (C. R.). **The 'shab' disease of Lavender.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 149–176, 1 pl., 4 figs., 2 graphs, 1931.

This is an expanded version of the author's investigation of the 'shab' disease of lavender caused by *Phoma lavandulae* in England,

the results of which have already been noticed from another source [*R.A.M.*, ix, p. 247].

VAN SLOGTEREN (E.). **Warm-waterbehandeling van Narcissen en bolrot.** [Warm water treatment of Narcissi and bulb rot.] —Reprinted from *Weekblad voor Bloembollenkultuur*, xlii, 15, 15 pp., 7 figs., 2 graphs, 1931.

The results [which are discussed and tabulated] of experiments conducted at Lisse, Holland, in the control of *Fusarium* bulb rot of narcissi [*R.A.M.*, viii, p. 383; cf. also ix, pp. 623, 700, x, p. 794] showed that the ordinary hot water treatment (immersion for 1½, 2½, or 3½ hours at 43½° C.) was quite inadequate for this purpose, actually resulting in an average reduction of 37·3 per cent. in the weight of the bulbs of the Colorable variety. On the other hand, immersion for the same periods in 0·5 per cent. uspulun, 0·5 per cent. germisan, or 1 per cent. formalin at 43½° resulted in increased yields of 100·8, 111·6, and 106·9 per cent., respectively. The outcome of eight hours' immersion of the bulbs in the same preparations at 18° was somewhat less satisfactory.

VAN SLOGTEREN [E.]. **De behandeling van het plantgoed van Tulpen met verschillende desinfectantia. (Voorloopige mededeling).** [The treatment of Tulip bulbs with various disinfectants. (Preliminary note).]—*Lab. voor Bloembollenonderzoek te Lisse, Meded.* 41, 3 pp., 1931.

The best control of *Sclerotium perniciosum* and *S. tuliparum* on Prins van Oostenrijk, Murillo, and William Copland tulips [*R.A.M.*, x, p. 32] in a recent series of experiments in Holland was given by 8 hours' immersion of the bulbs in 1 per cent. commercial formalin at a temperature of 18° C., the increased yields from the treatment (based on bulb weight) being estimated at 91·7, 53·9, and 159 per cent., respectively, for the three varieties.

WILSON (A. R.). **Armillaria mellea as the probable cause of a disease of Iris.**—*Gard. Chron.*, xci, 2352, p. 65, 1932.

The examination, at the Department of Mycology, Edinburgh University, of wilted specimens of *Iris kaempferi* sent from the New Forest for three consecutive years, revealed the presence on the upper part of the rhizomes of extensive mycelial pockets, from which *Armillaria mellea* was isolated and cultured. Although inoculation experiments gave negative results, it seems reasonable to conclude that the fungus was the cause of the disease. The fact that the ground on which the plants were grown was formerly under timber would probably account for the large number of rhizomorphs in the soil. The only monocotyledons hitherto recorded as having been attacked by *A. mellea* in Great Britain are *Canna indica* and *Narcissus* sp.

WHITE (R. P.). **Pathogenicity of Pestalotia spp.**—*Fifty-first Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1930*, pp. 264–268, 3 figs., 1930. [Received March, 1932.]

Further experiments on the pathogenicity of various species of

Pestalozzia to ornamental plants in New Jersey [*R.A.M.*, ix, p. 389] showed that *P. palmarum* is unable to infect healthy tissues of *Howea forsteriana*, to which it gains entrance through injuries or following other fungi. *P. guepini* is also only able to penetrate the tissues of *Camellia japonica* through wounds; it may, however, cause serious damage to the host, all large injuries on which should therefore be protected by a mercury disinfectant and a wound dressing. *P. stellata* on *Ilex opaca* appears to be the weakest pathogen of the six hitherto reported, heavy spore suspensions on scalded leaves being necessary to produce infection. *P. funerea*, on the other hand, may become a serious factor in the propagation of coniferous evergreens, such as *Cryptomeria*, *Pinus*, *Chamaecyparis*, *Thuja*, and *Juniperus*, a large proportion of grafted stock being lost through attacks of this fungus. At a more advanced stage the plants may be protected by frequent applications of a chlorophenol mercury preparation (1 oz. per 3 galls. water).

BONGINI (VIRGINIA). **Sur una vaiolatura del Trifoglio e dell' Erba medica.** [On a leaf spot of Clover and Lucerne.]—*La Difesa delle Piante*, viii, 4, pp. 1–3, 1931.

In the summer of 1931 the leaves of lucerne growing in northern Italy developed small dark spots bearing on the lower surface fuliginous, single or subfasciculate conidiophores with the conidia of a *Macrosporium*. The conidiophores averaged 35 by 5μ and were septate, with a slightly swollen apex. They bore dark, smooth conidia measuring 22 to 28 by 15 to 17μ, often subglobose or even globose (15 by 15μ), usually with three transverse and one well defined longitudinal septa as well as oblique septa less dark in colour. The conidia were constricted at the median transverse septum and some were rather pointed at the base. The conidial characters differentiate this fungus from *M. medicaginis*, which causes a leaf spot of the same host, *M. meliloti*, and *M. globuliferum*. It is, however, regarded as identical with *M. sarcinaeforme* Cavara, from which Tehon and Daniel's *Thyrospora sarcinaeforme* [*R.A.M.*, v, p. 232] is considered to be distinguishable by its echinulate epispore. It is pointed out that Cavara's fungus is stated by Ferraris to have a smooth epispore and is figured as such in the Flora Italica Cryptogama (1910).

YARWOOD (C. E.). **Ampelomyces quisqualis on Clover mildew.**—Abs. in *Phytopath.*, xxii, 1, p. 31, 1932.

During the late summer and autumn of 1931, *Ampelomyces quisqualis* [*Cicinnobolus cesatii*: *R.A.M.*, x, p. 744], was apparently responsible for the almost complete destruction of *Erysiphe polygoni* on red clover [*Trifolium pratense*] on experimental plots in Indiana [ibid., viii, p. 176; cf. also xi, p. 246]. It was further isolated in pure culture from the following: *Microsphaera alni* [var.] *vaccinii* on the catalpa, *Sphaerotheca pannosa* on rose, *E. cichoracearum* on zinnia and *Ambrosia artemisiifolia*, *M. alni* on *Lonicera* sp., and an undetermined species of mildew on *Plantago major*. The isolations from the first five hosts show differential cultural characters on agar. Infection of *E. polygoni* on clover

resulted from inoculations with spore suspensions of cultures from the clover, catalpa, and rose mildews. The optimum temperature for spore germination of *A. quisqualis* and for infection of clover mildew is about 25° C. Pycnidia are produced in abundance in about six days following inoculation of living mildew, but growth and pycnidial formation are very slow in agar cultures. At 25° growth and conidial formation of clover mildew colonies may be completely arrested in about eight days after inoculation with *A. quisqualis*.

Siegler (E. A.) & Piper (R. B.). **Pathogenesis in the woolly-knot type of crown gall.**—*Journ. Agric. Res.*, xliii, 11, pp. 985–1002, 4 figs., 1931.

The experiments described in detail in this paper were made in continuation of the senior author's study of the woolly-knot type of crown gall (*Bacterium tumefaciens*) on the apple [*R.A.M.*, ix, p. 188]. The chief result was to show that when seedling apple understocks were immersed in a water suspension of the organism one month before grafting a fairly high percentage of infections ensued, while when the understocks were thoroughly washed with water before grafting, the resulting trees were practically free from malformations. Ninety-four per cent. of the grafts inoculated at the point of union at the time of grafting became infected. Numerous infections also occurred on trees worked on uninoculated seedling stocks which were not washed before grafting, indicating that seedlings may be in nature a serious source of infection owing to their surface contamination with the crown gall organism. This point must be taken into consideration when interpreting the results of experiments on control either by disinfectants or by wraps.

Huber (G. A.). **The fungi present on the surfaces of normal Apples and their relation to decay.**—Abs. in *Phytopath.*, xxii, 1, p. 13, 1932.

Unidentified species of the following genera, capable of rotting apples, were obtained from the surfaces of normal apples collected from Kennewick and the Spokane, Yakima, and Wenatchee Valleys, Washington: *Sporormia*, *Pyrenochaeta*, *Chaetomella*, *Aspergillus*, *Verticillium* (three forms), and *Podosporiella* (two forms).

Clara (F. M.). **A new bacterial disease of Pears.**—*Science*, N.S., lxxv, 1934, p. 111, 1932.

In the course of a study on the green fluorescent bacterial plant pathogens, a highly virulent organism was obtained from a culture of *Erwinia amylovora* [*Bacillus amylovorus*], in which it appeared as a contaminant. Inoculation experiments on the fruits, flowers, and leaves of a hybrid pear, *Pyrus communis* × *P. serotina*, clearly proved the pathogenic nature of the organism, which produces round, black spots on mature foliage and on young and ripe fruits; on young leaves the spots are encircled by a yellow halo and are often accompanied by distortion. Cross-inoculation tests showed the organism to be pathogenic to cowpea, bean (*Phaseolus vulgaris*),

Pueraria hirsuta, broad bean (*Vicia faba*), beet, lilac, and bird cherry (*Prunus avium*).

The fluorescent organism was identified as a *Pseudomonas* distinct from *P.* [*B.*] *barkeri* and *P. nectarophila* [*Bacterium nectarophilum*: *R.A.M.*, xi, p. 159], and also from *P. syringae* [ibid., xi, p. 249], *P. vignae*, and *P. viridiflava*, though closely resembling the three last-named. Fluorescence may be readily observed in a medium consisting of 0·3 gm. $MgSO_4$, 2 gm. K_2HPO_4, and 3 gm. asparagin per l., adjusted to about P_H 6·9. The pathogen is named *P. utiformica* sp. nov. (according to Bergey's classification) with a technical diagnosis in English. It consists of rods with rounded ends, 1·3 to 3·1 by 0·7 to 1·5 μ, occurring singly and in pairs and motile by one or two polar flagella; is Gram-negative, non-acid fast, liquefying gelatine, producing ammonia, and fermenting dextrose, galactose, levulose, mannose, arabinose, xylose, sucrose, raffinose, mannitol, glycerine, and salicin; and it forms round or fimbriate, greyish-white to slightly greenish colonies on beef extract agar. Growth is inhibited by the presence of tartaric acid.

WORMALD (H.). **Bacterial diseases of stone fruit trees in Britain. III. The symptoms of bacterial canker in Plum trees.**—*Journ. Pomol. and Hort. Science*, ix, 4, pp. 239–256, 4 pl., 1931.

In this paper the author gives a detailed account of his investigation of the bacterial canker of plum trees in England, a preliminary description of which has already been published [*R.A.M.*, viii, p. 182]. It is considered to be probably identical with the die-back disease of plums that has been attributed to various causes in England in recent years [ibid., iii, p. 217; iv, p. 740; vii, p. 647]. The symptoms on young nursery trees are very similar to those on orchard trees; usually, however, they are more pronounced on the former, and the more severely attacked trees fail to make any growth during the season. Monthly inoculations on the stems have shown that the critical period for infection is from October to December, inclusive, since inoculations during the remainder of the year failed to give positive results.

The causal organism, whose group number has been determined as 211·2222032 in the classification of the Society of American Bacteriologists, is closely related to *Pseudomonas prunicola* [ibid., xi, p. 249], but differs from it in some cultural characters (a detailed description of which is being prepared); as it appears not to have been described previously, the name *P. mors-prunorum* is proposed for it. The paper terminates with a brief discussion of possible methods for the control of the disease.

ADAM (D. B.) & PESCOTT (R. T. M.). **Strawberry culture. Fungus diseases and insect pests.**—*Journ. Dept. Agric. Victoria*, xxx, 1, pp. 21–25, 2 figs., 1932.

Besides the insect pests enumerated in this paper, the authors state that the chief fungal diseases of strawberries in Victoria are leaf spots caused by a number of fungi, of which *Mycosphaerella fragariae* is probably the most common; plant failure, chiefly ascribed to soil deficiency and to secondary attacks by various

fungi, including species of *Pythium*, *Rhizoctonia*, and *Botrytis*; and finally, transit and market rots of the fruit, those caused by *Botrytis* sp. and *Rhizopus nigricans* being most frequently met with.

BROOKS (A. N.). **Crimp—a nematode disease of Strawberry.**—*Florida Agric. Exper. Stat. Bull.* 235, 27 pp., 5 figs., 1931.

The so-called 'crimp' disease of strawberries in Florida, which has now been shown to be due to the nematode, *Aphelenchus fragariae*, is stated to be identical with strawberry 'dwarf' occurring in Louisiana and other southern States, and possibly with 'red plant' described from Great Britain, but different from the 'cauliflower disease' also reported from the latter country [*R.A.M.*, xi, p. 250].

MUSKETT (A. E.) & TURNER (E.). **The control of American Gooseberry mildew in Northern Ireland. Part II.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 83–96, 2 figs., 1931.

Further tests conducted in Northern Ireland from 1927 to 1929 with various fungicides for the control of American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, vi, p. 674] showed that when washing soda (with soft soap, 4 lb. per 100 galls., or skimmed milk, 1 gall. per 100 galls., as spreader) was used, it gave the best all-round results at a concentration of 2 oz. per gall., at which strength no injury was caused to the bushes. In 1927, two applications reduced fruit infection from 94 to 77·5 per cent., and on bushes sprayed in February with caustic soda (1 lb. to 5 galls.) to 56·2 per cent. In 1928, when the disease was less severe, two similar applications on bushes previously sprayed with caustic soda reduced infection from 20 to only 5 per cent. The caustic soda treatment did not improve the highly satisfactory control given by ammonium polysulphide, though it did enhance the somewhat unsatisfactory control given by alkaline Burgundy mixture (8-20-100) and by ammonium copper carbonate.

In 1928, finely ground sulphur applied with a small hand bellows at the rate of 2 lb. of sulphur for 16 medium-sized, five-year old bushes, the treatment being given on two sunny days about noon and the bushes previously sprayed with water, reduced infection from 80 to 6 per cent., the latter figure being only 1 per cent. when the bushes were sprayed in February with caustic soda. A year later, the same form of sulphur applied on two occasions at noon to perfectly dry leaves not previously treated with caustic soda reduced infection from 95 to 3·75 per cent.; flowers of sulphur gave an equally good result, and ammonium polysulphide plus soft soap gave 5 per cent. infection.

It is concluded that sulphur dusting and ammonium polysulphide spraying are equally efficacious in the control of the disease, but that on bushes highly susceptible to sulphur injury (e.g., the Amber varieties) the best treatment hitherto found is spraying with washing soda and soft soap.

The search for existing resistant varieties suitable for commercial purposes failed.

This work terminates eight seasons' experiments and leads to the

conclusion that satisfactory control of American gooseberry mildew may be obtained by two applications in summer of: (1) ammonium polysulphide spray 1 in 200 plus 4 lb. soft soap per 100 galls. (cost 15*s.* 6*d.* per 100 mature bushes); or (2) a good ground sulphur dust or flowers of sulphur, about 20 lb. per 100 bushes (cost 12*s.* per 100 bushes); or (3) lime-sulphur 1 in 100 plus 1 gall. skimmed milk or 4 galls. flour paste per 100 galls. (cost 11*s.* per 100 bushes).

Amber and other varieties liable to sulphur injury should be sprayed in February with caustic soda (2 lb. per 10 galls.) and then receive two summer sprayings with washing soda (2 oz. per gall.) plus 1 gall. skimmed milk per 100 galls. (cost 19*s.* 6*d.* per 100 bushes).

COOLEY (L. M.) & RANKIN (W. H.). **Virus disease control experiments in Black Raspberry plantings in 1931.**—*New York* (*Geneva*) *Agric. Exper. Stat. Bull.* 601, pp. 3–6, 1931.

Experiments were started in 1931 on the control of virus diseases, especially red mosaic, in the black raspberry [*Rubus occidentalis*] plantings of Erie County, New York [*R.A.M.*, x, p. 530]. Twenty-two plantings, comprising 84,000 plants of the Cumberland and Plum Farmer varieties, were made by sixteen co-operating growers for the trials, each planting being inspected twice (from 7th July to 15th August and from 9th to 29th September).

In the parent Cumberland plantings (originating in Ohio where inspection and roguing are regularly carried out) red mosaic was present to the extent of 0·07 and 0·06 per cent. in 1930 and 1931, respectively, while in the New York plots 0·83 per cent. of the 49,337 plants of this variety were affected; increases in red mosaic were also observed in some of the New York Plum Farmer plantings (0·49 compared with 0·07 and 0·44 per cent. in Ohio in 1930 and 1931, respectively). On the other hand, the incidence of severe streak [ibid., x, p. 804] was considerably lower in New York than in Ohio (0·18 per cent. in Cumberland and 0·02 per cent. in Plum Farmer compared with 0·36 and 1·09 per cent. in 1930 and 1931, respectively, for the former and 0·74 and 0·17 per cent., respectively, for the latter, in Ohio).

In most of the experimental plots an invasion of the red mosaic virus from outside sources was indicated—probably diseased wild or cultivated red, and to a lesser extent purple [*R. neglectus*] and black raspberries within a 50 ft. radius. In some of the test plantings red mosaic had apparently spread from neighbouring cultivated Columbian plants showing the typical mild mosaic symptoms.

KAISER (P.). **Das Rutensterben der Himbeeren.** [Cane blight of Raspberries.]—*Gartenflora*, lxxxi, 1, p. 24, 1932.

Cane blight of raspberries, which is stated to be constantly on the increase in Germany, is usually attributed to *Didymella applanata* [*R.A.M.*, x, p. 804], but the writer suspects, from observations and experimental work, that the primary agent of the disease is a gall fly belonging to the genus *Diplosis*. The fungus enters the canes through the wounds made by the insects in feeding and thence spreads to the healthy parts of the cortex. The

Diplosis larvae emerge from the eggs early in April and begin to feed below the cortex. Control measures should be based on the joint extermination of insect and fungus and should include liberal applications of lime to the soil, sparing use of nitrogen, repeated spraying in the spring with 1 per cent. solbar or Bordeaux mixture, and careful selection of healthy seedlings.

RHOADS (A. S.). **Clitocybe mushroom root rot—a new disease of Bananas.**—Abs. in *Phytopath.*, xxii, 1, p. 23, 1932.

Mushroom root rot (*Clitocybe tabescens*) [see above, p. 365] has been found attacking and killing bananas of several varieties, including Dwarf Cavendish, at Artesia and Nocatee, Florida. The bases of the diseased plants showed a watery, brownish discoloration, with sheets of mycelium and a luxuriant development of rhizomorphs between the leaf stalk bases and within the loose tissues of the same. The rhizomes of infected plants were permeated by numerous mycelial sheets, and the fungus spread to all the plants in the clump, which was eventually killed.

ASHBY (S. F.). **Gloeosporium strains. Notes on thirty-two isolations of Gloeosporium from Bananas in Trinidad.**—*Trop. Agriculture,* viii, 12, pp. 322–325, 1 pl. [facing p. 332], 1931.

The author states that the cultural study of 32 strains of *Gloeosporium* isolated from banana fruits in Trinidad showed that four of these strains produced perithecia in culture and are referable by the characters of their ascogenous stage to *Glomerella cingulata* [*R.A.M.*, x, p. 483]; the range of the spore measurements of their conidial stages was 11·5 to 19 by 4·5 to 6·3 μ. Of the remaining 28 strains, all of which are referred, in the absence of the perfect stage, to *Gloeosporium musarum* [ibid., xi, p. 189], 21 are regarded as representing the normal type with conidia that are very uniform in shape and vary in size within the limits 11·5 to 17 by 5 to 7 μ, and seven exhibit a more or less appreciable variation from the normal type, their conidia being less regular and ranging in size from 12 to 17 by 4·5 to 6·5 μ. It is pointed out that isolations from green bananas in Ceylon and from ripe bananas in the Central Provinces of India produced types of growth and conidia in pure culture which were quite similar to those of some members of the normal Trinidad group.

A description is given of the morphological and cultural characters of the various strains and a note on the type specimen of *G. musarum* in Kew Herbarium, the spores of which were found by Miss Wakefield to be 12 to 20 by 5 μ (mean about 15 by 5 μ) and not 10 to 12 by 4 μ as given in the original diagnosis. All the author's strains produced, in addition to the free conidiophores, others lining the cavities of black, hemispherical or irregular, stromatoid, pseudoparenchymatous surface outgrowths, which eventually opened exposing the hymenial layer.

WARDLAW (C. W.). **Banana diseases. 3. Notes on the parasitism of Gloeosporium musarum (Cooke & Massee).**—*Trop. Agriculture,* viii, 12, pp. 327–331, 1 pl. [facing p. 313], 1931.

In this, the third paper of this series [*R.A.M.*, xi, p. 312], the

author gives an account of the fruit rot of bananas caused by *Gloeosporium musarum* in Trinidad, where the fungus has been observed in storage or transit attacking the main stalks, finger stalks (causing finger drop), and the fingers in the form of spots, blemishes, or a conspicuous tip-rot [ibid., x, p. 806], but never on unreaped immature fruit. Field inoculations [details of which are given] with three strains belonging to Ashby's 'normal' group [see preceding abstract], both during the wet and the dry season, gave negative results on fruits of varying age still attached to the plants. Further experiments indicated that the fungus attains its greatest activity on fruits approaching maturity in storage, and that infections established at tropical temperatures are responsible for the greatest amount of wastage. These observations lead the author to consider that successful control of the rot caused by *G. musarum* during sea transport in cold storage may be ensured by the following measures: reaping the fruit at the correct stage of maturity, reducing to the minimum the time during which the reaped fruit is exposed to tropical temperatures, rapid cooling in the holds, careful handling of the fruit, and rapid ripening after unloading. Some histological details are also given of the invasion of the fruit tissues by the fungus.

CHEESMAN (E. E.). **Banana breeding at the Imperial College of Tropical Agriculture. A progress report.**—*Empire Marketing Board Publ.* 47, 35 pp., 9 pl., 1931.

In this paper the author reports on the progress so far attained in the task initiated in 1922 at the Imperial College of Tropical Agriculture, Trinidad, of breeding a variety of banana which should both possess the qualities required by the trade and be resistant to Panama disease [*Fusarium cubense*: *R.A.M.*, xi, p. 61]. Considerable details are given of numerous interspecific crosses which were attempted in the genus *Musa*, among which the commercially most suitable Gros Michel banana when pollinated with a fertile species, believed to be *M. malaccensis*, produced a few seeds from which plants have been raised closely resembling the Gros Michel parent. One of these, which has been named I.C. 1. [Imperial College No. 1], has shown resistance to Panama disease, and is being propagated vegetatively for further studies, but it does not back-cross readily to Gros Michel, and further progress in this direction is not very promising. About half of the eighty varieties of bananas collected at the Imperial College proved capable of producing seed, and progenies are being raised for study from those that have good commercial qualities.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Transport and storage of Bananas with special reference to chilling.**—*Empire Marketing Board Publ.* 45, 40 pp., 7 figs., 1931.

This report is the complete account of the authors' investigations conducted in Trinidad to find a substitute for the Gros Michel banana [owing to its susceptibility to *Fusarium cubense*] and to prevent wastage during transit, a full summary of which [erroneously stated to be a précis of a previous report] has already been noticed from another source [*R.A.M.*, x, p. 806].

CURZI (M.). **Una nuova specie di 'Helminthosporium' in una malattia del Banano segnalata nella Somalia Italiana.** [A new species of *Helminthosporium* in a disease of Banana reported in Italian Somaliland.]—*Rendic. R. Accad. Lincei*, xiv, Ser. 6, 3–4, pp. 146–149, 1 fig., 1932.

Canary bananas (*Musa cavendishii*) in Italian Somaliland recently developed an extensive spotting with which a species of *Helminthosporium* was constantly associated. On the stems and scapes the spots appeared as deep-seated necroses, sometimes sunken, cracked, and surrounded by a well-marked margin; on the leaves they extended for the most part over entire sections of the blade, and were bordered by a dark line. The conidiophores were sparse, fuliginous, erect, septate, the distal end being somewhat irregularly thickened, contorted, undulating, and showing scars corresponding to the attachment of the conidia. The latter were light olivaceous at first then suddenly darkening, with the third or penultimate cell darker and larger than the rest, and the end cells lighter and slightly tapering towards the apex and base. After the first stage in their development they ceased to be equilateral and, at maturity, one side was almost flat or even concave, while the other was markedly convex. Over 95 per cent. of the conidia were triseptate and measured 20 to 34 by 11 to 16 μ. Germination occurred only from the two polar cells. Other ellipsoidal or clavate, slightly curved, 5- to 9-septate macroconidia were observed only in necrosed areas on the pseudo-stems and scapes; they were a lighter fuliginous colour than the microconidia, and measured 55 to 87 by 12 to 15 μ.

The author considers his fungus to be a new species belonging to the *Eu-Helminthosporium* group [*R.A.M.*, viii, p. 529] and names it *H. gibberosporum*.

Artificial inoculations of *M. sapientum* in the Botanical Gardens, Rome, with pure cultures of the fungus gave positive results.

FELLERS (C. R.) & CLAGUE (J. A.). **Souring of Dates by yeasts.**—Abs. in *Journ. of Bact.*, xxiii, 1, p. 63, 1932.

Spoilage of commercial dates by yeasts is stated to cause considerable losses, especially in wet seasons [cf. *R.A.M.*, x, p. 656]. Sour fruit is usually soft, dark, and aromatic in odour and flavour. Souring is apt to occur when the moisture content exceeds 23 to 25 per cent. Several closely allied types of yeasts were isolated from soured samples of Iraq, Algerian, and Californian dates. The organisms were grown in pure culture and produced typical souring in sound, pasteurized dates with a moisture content of about 25 per cent. *Acetobacter* was sometimes associated with the yeasts on sour dates. Souring may be effectively controlled by drying the fruit to a maximum moisture content of approximately 23 per cent. and maintaining it during shipment and storage at or preferably below this figure. Pasteurization of the dates by holding them at 160° F. for one hour at a relative humidity of about 70 per cent. is a further effective control measure.

LACY (M. E.). **Stationary spray plants for commercial and farm orcharding.**—*Agric. Engin.*, xiii, 1, pp. 19–20, 2 figs., 1932.

Details are given of the 15 stationary spray plants inspected by

the writer in Georgia orchards [cf. *R.A.M.*, x, p. 673]. These are mostly used by apple growers, but there are several in pecan groves, and one in a 160-acre peach orchard. The average cost of the complete installation is $31·16 per acre. The engines used include Fords, Chevrolets, and Bean Le Roi with a range of 6 to 22 h.p. The length of hose used ranged from 150 to 400 ft.

The stationary spray plant.—*Fruit World of Australasia*, xxxii, 9, pp. 513–514, 2 figs., 1931.

After referring to the great success which has attended the installation of stationary spray plants [see preceding abstract] in orchards in New Zealand, Tasmania, and the Pacific coast area of the United States, the author gives some interesting details received from Tasmanian growers as to costs, manner of arrangement, etc., of such outfits. Ample evidence has been obtained that the stationary system can be made to halve the cost of spraying, even taking the capital charges into consideration, while it also enables the trees to be sprayed at any critical time, whatever the condition of the ground. Incidental advantages are the better spraying obtainable as a result of the higher pressures used, the avoidance of damage to trees and crop, and the greatly reduced cost of upkeep as compared with that of portable sprayers.

Wilcoxon (F.) & McCallan (S. E. A.). **The fungicidal action of sulphur. III. Physical factors affecting the efficiency of dusts.**—*Contrib. Boyce Thompson Inst.*, iii, 4, pp. 509–528, 1 fig., 5 graphs, 1931.

Studies were carried out, by methods previously described [*R.A.M.*, x, p. 741], to determine the physical factors influencing the toxicity of sulphur dusts towards *Sclerotinia americana*. The so-called 'straight' dusts (i.e., those consisting of ground sulphur without additional substances) used in the tests were 200-mesh sulphur (Niagara Sprayer & Chemical Co., Middleport, N.Y.), dusting sulphur (Ansbacher-Siegle Corp., New York), Aero Smoke (American Cyanamid Co., New York), and 300–7 dusting sulphur (National Sulphur Co., New York). The modified dusts (those to which gums, proteins, infusorial earth, bentonite [ibid., x, p. 533], or the like are added to modify the properties of the sulphur) were sulpho-tone (Lucas Kil-Tone Co., Vineland, N.J.), Orchard brand dritomic sulphur (General Chemical Co., New York), and kolodust (Niagara Sprayer & Chemical Co.). The sprays consisted of two suspensions, viz., flotation ferrox sulphur (Koppers Products Co., Pittsburgh) and mulsoid-sulphur (Sherwin Williams Co., Cleveland), and two colloids, namely, colloidal sulphur (Premier Mill Corp., Geneva, N.Y.) and ialine (Burt, Boulton, and Haywood, Ltd., London) [ibid., xi, p. 194].

The results of the trials [which are fully discussed and tabulated] showed that the straight dusts are at least equal in toxicity to the modified ones, even after exposure to artificial 'rain' for 30 seconds (0·3 inches of 'rain'). Adherence to a smooth surface was inversely proportionate to particle size. The colloidal sulphur sprays were found to be more toxic than the other preparations when tested on an equal weight basis. No correlation could be

found between the toxicity of the dusts and the acidity of their water extracts.

A convenient method for the determination of the mean particle size of sulphur dusts is described, involving a count of the number of particles furnished by a known weight of sulphur dusted on a surface of known area. The relative toxicity of the sulphur dusts was shown to be directly proportionate to the number of particles. The mean particle diameters of Niagara-200, Ansbacher-Siegle, and National 300–7 were found to be 26·5, 22·4, and 18·0 μ, respectively. These dusts showed no significant differences in toxicity when applied to give the same number of particles per unit area. On an equal weight basis the mean particle size of the dusts, therefore, is the most important single factor contributing to their toxicity. The dimensions of the particles of ialine and Premier Mill were 0·5 and 2·4 μ respectively.

A useful measure of the dusting qualities of sulphur in regard to the properties of flowing freely and forming a cloud was found in the 'angle of slope', i.e., that between the side and the base of a cone of dust built up to the maximum height attainable. The dusts showing small angles of slope, i.e., sulpho-tone (44°18′), National 300–7 plus 5 per cent. inert filler (44°32′), and kolodust (45°48′) dust more freely and flow better than those with larger angles.

ORTON (C. R.). **Seed-borne parasites—a bibliography.**—*West Virginia Agric. Exper. Stat. Bull.* 245, 47 pp., 1931.

The present list of bibliographical references to the more important papers on seed-borne diseases of plants (using the word 'seed' to connote the bodies containing an embryo and employed for propagation) is preceded by concise notes on the early history of seed transmission of parasites; the distribution of important plant diseases by seed; the manner in which pathogens are seed-borne; the nature of seed-borne parasites; and the commercial aspect of seed transmission of the parasites.

CUNNINGHAM (G. H.). **Standardization of common names of plant diseases.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 145–148, 1931.

In pointing out the inconsistencies noticed by him in the list of common names of plant diseases suggested by the Plant Pathology Sub-Committee of the British Mycological Society [*R.A.M.*, viii, p. 517], which are considered to be a source of confusion, the author states that a way out of the difficulty would be for each pathogen, where it is known, to bear a common name, irrespective of the number of symptoms caused by it or of its host range. A start in this direction has already been made in modern literature, as instanced by the designations 'American mildew' and 'European mildew' for *Sphaerotheca mors-uvae* and *Microsphaera grossulariae*, respectively, on the gooseberry, and black rust and yellow rust for *Puccinia graminis* and *P. glumarum*. The name selected should be easy to pronounce, in order to render it acceptable in general practice, and, in the case of common names already in use, preference should be given to the one most generally employed in the British Empire, a point which can be settled by consultation with

the official Chief Mycologist in each Dominion. Attention should also be given to the appropriateness of the term selected.

HANNAN (A. M.). **The influence of weather on crops: 1900–1930. A selected and annotated bibliography.**—*U.S. Dept. of Agric. Misc. Publ.* 118, 245 pp., 1931.

This bibliography of 2,324 titles of papers published between 1900 and 1930, arranged alphabetically under authors, dealing with various aspects of phenology in relation to crops, contains a number of references to the influence of weather on plant diseases.

EULER (H. v.), GARD (ULLA), & RISLUND (G.). **Katalase- und Zuckerbestimmungen in chlorophyll-defekten Pflanzen.** [Catalase and sugar determinations in chlorophyll-deficient plants.]—*Hoppe-Seyler's Zeitschr. für Physiol. Chemie,* cciii, pp. 165–176, 2 graphs, 1931.

Studies at the Biochemical Institute, Stockholm, on the leaf constitution of three types of chlorophyll-deficient plants, viz., hereditary white, yellow, and green barley mutants, variegated *Pelargonium zonale* and *Antirrhinum*, and *Abutilon striatum* with infectious chlorosis [*R.A.M.*, xi, p. 256] showed a general correlation in all cases between chlorophyll deficiency and the reduction of other substances, especially catalase. The white leaf portions of *A. striatum* contained barely a trace of tryptophane, the amount of which in the green parts was 0·76 per cent. of the dry weight.

KONDO (T.). **Zur Kenntnis des N-Gehaltes des Mykorrhizaknöllchens von Podocarpus macrophyllus D. Don.** [Contribution to the knowledge of the N-content of the mycorrhizal nodule of *Podocarpus macrophyllus* D. Don.]—*Bot. Mag.*, Tokyo, xlv, pp. 495–501, 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 1, p. (8), 1932.]

Determinations by the micro-Kjeldahl method of the nitrogen content of young and old mycorrhizal nodules of *Podocarpus macrophylla* [cf. *R.A.M.*, xi, p. 258] showed that soluble amide-, amino-, and ammonia-nitrogen are much more abundant in young nodules and roots than in old ones. In the former, therefore, a relatively large quantity of nitrogen is accumulated in a readily transportable form.

CAPPELLETTI (C.). **Sulla presenza di miceli nei tegumenti seminali di alcune Liliaceae e particolarmente nel genere Tulipa.** [On the presence of mycelia in the seed coat of some Liliaceae particularly in the genus *Tulipa*.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 479–508, 5 figs., 1931.

After stating that he has frequently observed the presence of fungal mycelium on the seeds of Liliaceae (*Tulipa, Lilium*, and *Fritillaria* spp.), the author gives a detailed account of the physiological significance of this association, which he regards as a new type of symbiosis, and describes the mode of penetration of the fungi concerned.

Mycelium was commonly noted on the outermost part of the seed coat in proximity to the open stomata; once established in the

thickness of the tegument, the fungus easily spreads therein as the deep cellular layers develop wide intercellular spaces through which the hyphae can pass around the whole seed-coat.

Infection of *Tulipa* seed was ascertained to take place during the ripening of the fruit. The best germination of the seeds was obtained at 0° to 6° C., which retarded the growth of the mycelium. At laboratory temperatures (14° to 18°) the fungi developed so vigorously that germination was inhibited.

The fungus most commonly found was *Sclerotium tulipae* Libert, while a new species, *Mycogone tulipae* [of which a Latin diagnosis is given], was also frequently found.

Only these two and some species of *Penicillium* were deep-seated, various other fungi that were present being regarded as unimportant.

Evidence was obtained that the stigma became infected in the first stages of its development, and the infection then spread to the carpellary wall. At the base of the carpels, at the insertion of the peduncle (inside the fruit), infection appeared rather late, shortly before the seed ripened. Infection was not transmitted to the young plants developing from the infected seeds nor was there any connexion between the fungi in the seed coats and those forming mycorrhiza.

The author considers that there is no doubt that the seeds remaining in the fruit when the latter has reached an advanced stage of maturity can become infected through the carpellary walls, the mycelium finding in the hot, moist carpellary cavity during the drying of the seeds a highly congenial environment. By reason of the slight effect produced upon the life of the plant the author considers that this seed infection of Liliaceae is a type apart, which he refers to as the '*Tulipa*' type of seed infection.

A bibliography of 16 titles is appended.

SMITH (F. E. V.). **Raising Orchid seedlings asymbiotically under tropical conditions.**—*Gard. Chron.*, xci, 2349, pp. 9–11, 4 figs., 1932.

A fairly exhaustive examination of hybrid *Cattleya* roots in Jamaica having shown that the mycorrhizal fungus [*Rhizoctonia repens*: *R.A.M.*, xi, p. 317] is very sparsely represented, experiments [which are fully described] have been successfully carried out in the asymbiotic germination of the seed of *Cattleya*, *Broughtonia*, *Epidendrum*, *Phalaenopsis*, and *Renanthera* by Knudson's method with certain modifications. The seed was removed from the capsules before dehiscence and sterilized with a saturated filtered solution of bleaching powder. It was then sown in Freudenreich flasks on pulped filter paper saturated with the nutrient solution at P_H 4·5 to 5, Knudson's solution B being that chiefly used, sometimes with increased nitrogen.

NORD (F. F.) & WEIDENHAGEN (R.). **Ergebnisse der Enzymforschung. I Band.** [Results of enzyme research. Volume I.] —xi + 377 pp., 11 figs., 2 diags., 48 graphs, Leipzig, Akademische Verlagsgesellschaft M. B. H., 1932.

In order to facilitate the study of the enzymes, it is proposed to

collect and publish at intervals a series of papers on the most important aspects on this subject, the literature on which is at present scattered through numerous scientific and medical journals. Owing to the position of enzymology on the borderline between physiology and chemistry, considerable difficulty may be experienced in keeping in touch with the available information on specific problems, a general survey of which will in future appear under the author's name as separate parts of these volumes.

The following are included in the present volume. (1) The thermodynamics of cells reactions, by E. I. Fulmer (English). (2) Significance of potentials of oxido-reduction for enzymatic reactions, by R. Wurmser (French). (3) Mechanism of enzymatic action, by A. Fodor (German). (4) Physico-chemical processes in enzyme reactions, by F. F. Nord (German). (5) Alcoholic fermentation. Fermentation in the yeast cells, by A. Harden (English). (6) Proteolytic enzymes of the animal and plant kingdoms, by W. Grassmann (German). (7) Specificity and mode of action of the carbohydrases, by R. Weidenhagen (German). (8) Bacterial enzyme reactions, by J. H. Quastel (English). (9) Vinegar fermentation, by A. Bertho (German). (10) Tyrosinase, by H. S. Raper (English). (11) Bone phosphatase, by R. Robison (English). (12) Crystalline urease, by J. B. Sumner (English). (13) Crystalline pepsin, by J. H. Northrop (English). (14) The oxygen-transmitting ferment of respiration, by A. Reid (German). (15) Biochemistry of the lower fungi, by H. Raistrick (English) [*R.A.M.*, xi, p. 119]. (16) On the development of activity in plant enzymes, by K. Suessenguth (German).

Scaramella (Piera). **Sugli enzimi e sulle tossine prodotte dal 'Rhizopus nigricans' Ehr. in rapporto alla loro azione sulla germinazione del Grano.** [On the enzymes and toxins produced by *Rhizopus nigricans* Ehr. in relation to their action on the germination of Wheat.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 371–408, 2 pl. [facing p. 578], 1931.

Studies [which are described in detail, and the results of which are tabulated and fully discussed] of the enzymes and toxins produced by *Rhizopus nigricans* [cf. *R.A.M.*, iii, p. 157; see also ibid., ii, pp. 464, 564] when grown in various [named] liquid media, and of their effect upon the germination of wheat seed showed that in vegetable broths prepared by triturating prunes, carrots, or potatoes in water, boiling for 30 mins. at 1·5 atmospheres, filtering, adjusting the reaction, and again autoclaving for 20 mins. the mycelium of *R. nigricans* produced pectinases abundantly, as determined by their macerating effect on carrot or potato disks, but in meat broth and synthetic liquids their presence could not be established; the greatest amount of pectinases was liberated in carrot and prune broth, and somewhat less in potato broth. In the decoctions used (potato and carrot) no pectinase was formed.

The greatest weight of mycelium was produced in prune broth, followed by carrot and potato broth. In Raulin's solution fructification was very rapid, while in meat broth it was very slow. At 18° C. the greatest amount of macerating principles developed in the mycelium after seven days. In carrot broth a very active

enzyme formed, capable of completely dissolving the middle lamella of carrot disks 100μ in thickness in under three hours and able to retard or inhibit the germination of wheat seed. The materials liberated by the fungus were very slow to penetrate the integument of wheat seed, but in the earliest stages of growth of the seedling the inhibiting action developed almost immediately. Wheat seed left for 12 hours in carrot broth in which *R. nigricans* had been grown, the seed then being left to germinate in the same liquid, was seriously injured: during the first 24 hours no germination occurred, after 48 hours there was 24 per cent. germination, and after 15 days a maximum of 35 per cent. was reached; the leaflets of the embryo did not emerge from the coleoptile, and there was no root development.

In potato broth active principles were also formed, but much more slowly than in carrot, and when produced they were weaker. In prune broth a very active macerating principle was produced. In meat broth and Raulin's medium no macerating enzyme was present, nor was any found in the mycelium grown in these media.

When up to 30 per cent. glucose was added to the liquid media it favoured the growth and fructification of *R. nigricans*, but higher concentrations reduced them, though fructification took place in concentrations up to 70 per cent. The fungus continued very slow growth even in a glucose concentration of 100 per cent. In the presence of over 10 per cent. glucose, independently of the P_H value of the medium, there was no production of pectinase. When glucose was added in various proportions to carrot broth in which *R. nigricans* had been grown and which was very rich in enzymes, and the liquid was allowed to act upon carrot disks, it was ascertained that a concentration of 3 per cent. glucose did not affect the action of the pectinases, one of 5 per cent. retarded it, and higher concentrations inhibited it.

The presence of growing *R. nigricans* affected the P_H value of both carrot and prune broth; when the solution was very acid the fungus tended to make it neutral and when alkaline, acid. The activity of the enzymes formed was directly related to the P_H value of the medium; at P_H 2·4 48 hours elapsed before the middle lamella of the carrot disks was dissolved, and the liquids had a slightly toxic effect on the germination of wheat. Enzyme action became progressively more intense as the P_H value rose to 5·6, when only 4 hours were required to dissolve the middle lamella of carrot disks, the percentage germination of wheat also being reduced. At about P_H 7 enzyme action ceased, but it began again at P_H 7·6, falling at higher concentrations.

During the first three weeks that *R. nigricans* was kept in culture, pectinases were produced in abundance; after one month the middle lamella of the carrot disks was no longer dissolved and the germination of wheat seed was unaffected. Boiled liquids in which *R. nigricans* had been cultured, however, became, progressively with the age of the culture, increasingly injurious to the germination of wheat seed. This was evidently due to the production of toxins and the toxic action progressively increased as enzyme action declined.

De Tomasi (J. A.). **Immunity in plants.**—*Phytopath.*, xxii, 1, pp. 95–102, 1932.

A review is given of the more important recent literature and investigations on congenital and acquired immunity in plants [*R.A.M.*, x, p. 612], the former phenomenon being considered under three aspects, viz., (1) mechanical defences dependent on the anatomical structure of the tissues; (2) actions of normal cellular and intercellular fluids before the parasitic attack; and (3) histogenic and humoral reactions of tissues to parasitic infection. Acquired immunity is discussed under the heads of vaccination and superinfection.

Dufrénoy (J.). **L'immunité locale.** [Local immunity.]—Reprinted from *1er Congrès. Internat. Microbiol.*, Paris, *1930*, 7 pp., 7 figs., 1931.

After pointing out that *Blepharospora* [*Phytophthora*] *cambivora* produces only very superficial necrosis of the tissues of Far Eastern varieties of chestnut [*R.A.M.*, vii, p. 549; x, p. 68], the author states that in the tissues which the fungus attempts to attack, the cells situated some distance away from those already parasitized show profound metabolic disturbances: in particular the content of the vacuoles becomes rich in phenolic compounds, with the result that the penetration of an electrolyte or of various suspensions causes the formation of abundant intravacuolar phenolic precipitates. This formation of phenolic compounds in cells threatened with infection corresponds to local immunity [ibid., ix, p. 51].

In the case of parasites which cause localized lesions, such as circular spots on leaves or branch cankers, the cells at first react as if susceptible, but around those which have become invaded a layer of cells accumulates phenolic compounds and bars the further advance of the fungus. Thus, in the centres of the leaf spots produced on *Arisaema triphyllum* by *Uromyces caladii*, those produced on *Asphodelus* by *Puccinia asphodeli*, and certain spots produced by *P. sorghi* [*P. maydis*] on susceptible maize varieties, the cells penetrated by the haustoria remain living and may even show a greater or more lasting activity than the healthy cells (in autumn the persistent green spots on the yellowing leaves of *Asphodelus* correspond with the areas invaded by the rust) [cf. ibid., vi, p. 632]. The cells penetrated by the fungus retain their green plastids and show actively dividing mitochondria arranged in lines along the cytoplasmic trabeculae separating the small vacuoles which are poor in phenolic compounds. At the periphery of the spot, beyond the infected area, the unaffected cells are found to have retained their large central vacuole and to have accumulated phenolic compounds.

Johnson (B.). **Specificity to penetration of the epidermis of a plant by the hyphae of a pathogenic fungus.**—*Amer. Journ. of Botany*, xix, 1, pp. 12–31, 1 pl., 1 fig., 1932.

Little experimental work has been done on the problem of 'specificity' to attack by disease-inducing organisms, as distinct

from immunity, resistance, and susceptibility, the term 'specificity' against a parasite being used in the sense of any immunity connected with species and genera.

Colletotrichum circinans, the causal organism of onion smudge [*R.A.M.*, x, pp. 499, 701], is usually considered to be limited in its host range to *Allium* spp., though it has been found capable of attacking apple fruits [ibid., i, p. 278]. Experiments were therefore conducted to ascertain whether this fungus could penetrate a number of other plants grown as far as possible under ordinary greenhouse conditions. Penetration of the leaf epidermis was found occasionally in most of the plants tested [a list of which is given]. The epidermal walls reacted by the formation of penetration pegs, staining with magdala red, underneath the appressoria, but only a few showed the passage of an infective hypha into the cell. Of the hosts studied the onion was the only one showing no formation of pegs.

Peas, *Eschscholzia californica*, nasturtium (*Tropaeolum majus*), and green leaves of onion all showed apparently normal hyphae ramifying throughout the tissues, some of which were more or less disintegrated after three days. When inoculated leaves of the other hosts tested were surface-sterilized and incubated in prune agar it was found that nearly all the hosts sometimes contained viable mycelium of the fungus after three days. When young plants were inoculated, nearly all the hosts tested sometimes developed lesions, and acervuli formed in many. In some the attack was so severe that the plant perished. Peas developed a disease characterized by wilting, curling, and browning of the leaves when kept in a moist chamber after inoculation, but not under ordinary greenhouse conditions.

These studies (which were supplemented by a statistical classification of the reactions of 19 plants) give no indication of narrow specificity in the response of the leaves of various experimental hosts to infection by *C. circinans*.

STEINBERG (R. A.). **An apparatus for growing plants under controlled environmental conditions.**—*Journ. Agric. Res.*, xliii, 12, pp. 1071–1084, 3 figs., 5 graphs, 1931.

A detailed description is given of the construction and working of an improved apparatus for growing experimental plants under controlled conditions of light, temperature, humidity, air velocity, and soil moisture [cf. *R.A.M.*, ix, p. 523]. An even distribution of light is effected by the use of a 1,000-watt 110-volt gas-filled tungsten lamp enclosed in a globular water screen, the temperature within which is kept down by the circulation of cold water. Temperature, air humidity, and air velocity are controlled by a modified blast heating system with a pneumatically regulated air washer, and an automatic watering system maintains constant soil moisture and records transpiration. The apparatus is also adapted to conduct experiments with coloured light. It is stated that the results of experiments made with this apparatus agree within an error of 10 per cent. with those obtained in the open.

BRETT (MARGARET A.). **Cyclic saltation in Stemphylium.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 89–101, 1 pl., 4 figs., 1931.

A detailed account is given of a species of *Stemphylium* which was maintained in pure culture for over two years, and which, when grown on media of low nutritive value, produced two types of growth, namely, a slow growing, dark type, profusely sporulating in dense heads, and a lighter coloured, rapidly advancing type, with a weaker production of aerial spores and an abundant formation of submerged spores. In the original cultures the densely sporulating growth was disposed in radiating bands, the more sparsely sporing growth occupying the remainder of the culture. Carefully selected spores from the densely sporing bands produced colonies at first retaining the same character, but the feebly sporulating type of mycelium then developed near the centre and grew outwards in sectors, finally surrounding the area of dense sporulation; submerged spores were again numerous in the sectors. Occasionally densely sporing areas, bearing the spores in chains, as is characteristic of the form-genus *Alternaria*, were found in the dilution plates, and subcultures from this sporulation type have for seven generations produced some colonies in which the *Alternaria* type, associated with abnormal development of submerged hyphae, persisted. Single-spore cultures from these colonies gave sectors of *Stemphylium* growing out from the *Alternaria* type of growth [cf. *R.A.M.*, ix, p. 411].

Preliminary experiments indicated that the slower growing and densely sporulating mycelium is more sensitive to the staling products accumulating in the culture media than the other type, and that the spores produced by it have a lower capacity for germination than those of the latter.

MITRA (M.). **Saltation in the genus Helminthosporium.**—*Trans. Brit. Mycol. Soc.*, xvi, 2–3, pp. 115–127, 1 pl., 3 figs., 1931.

Continued study [details of which are given] of the eight forms of *Helminthosporium* described by the author in a previous paper [*R.A.M.*, x, p. 758] showed that six of them produced saltants in pure culture, 48 of which were isolated and investigated. Most of the saltants arose as isolated patches scattered over the surface of the parent culture, occurring most frequently in old cultures, on rich media, and in cultures maintained at about the optimum temperature for growth; new strains also arose sometimes as visible sectors which formed by preference in shallow places on the plates.

The results of the work indicated that the macroscopic characters (including intensity of sporulation) of the organisms are extremely variable, to a degree depriving them of any real taxonomic value. Although dimensions and septation of the spores vary considerably, most of the saltants resemble the parent forms in these characters; the shape and colour of the spores are fairly constant. Preliminary experiments tended to indicate that the saltants of *H. sativum* also vary within a wide range in their parasitic vigour.

QUANJER (H. M.). **Die Autonomie der phytopathogenen Virusarten.** [The autonomy of the phytopathogenic species of virus.]—*Phytopath. Zeitschr.*, iv, 2, pp. 205–224, 2 figs., 1931.

The writer here recapitulates and assembles his views previously noticed on the nature of the phytopathogenic viruses, with special reference to those affecting potatoes [*R.A.M.*, x, p. 745]. In his opinion, the attempt to unite the virus diseases and the necrotic tissue changes typifying them under a collective heading, such as the hypothetical *Plasmodiophora solani* [ibid., ix, p. 799], is opposed to the autonomous character of the phytopathogenic viruses, numerous proofs of which are here adduced.

SMITH (K. M.). **On the composite nature of certain Potato virus diseases of the mosaic group as revealed by the use of plant indicators and selective methods of transmission.**—*Proc. Roy. Soc. London*, Ser. B., cix, B762, pp. 251–267, 4 pl., 1931.

This is a detailed account of the technique used by the author [already briefly indicated in a previous paper: *R.A.M.*, x, p. 615] for the isolation of two viruses, *x* and *y*, from a symptomless streak carrier potato (Up-to-Date), and also of their reactions on a selected range of Solanaceous plants. In discussing the results obtained the author states that while the aphid-borne virus *y* appears to be a constant entity not liable to fluctuations in virulence, the virus *x* varies and produces several symptoms, e.g., a faint mottle, a type of veinbanding, and rings of different kinds.

In his opinion the different symptoms exhibited by the various mosaic diseases are due to strains of the *x* virus rather than to different viruses. There is little doubt of the almost universal occurrence of the *y* virus in potato virus diseases of the mosaic group, and in this respect it rivals the American 'healthy potato virus' except that it is usually associated with symptoms of the crinkle type. So far the *y* virus has been obtained from 20 examples of the potato diseases, mosaic, crinkle, and streak. In the field it has been found, apparently alone, causing a crinkle or mosaic in President, Arran Victory, and Epicure, while alone or in combination with the other virus it causes symptoms of leaf-drop streak in Up-to-Date. The *x* virus is widespread and in varying degrees of virulence has been found on many occasions in nature.

COTTIER (W.). **The transmission of virus diseases of the Potato by insects.**—*New Zealand Journ. of Sci. and Techn.*, xiii, 2, pp. 85–95, 7 figs., 1931.

Details are given of the writer's experiments under controlled conditions at the Plant Research Station, Palmerston North, to determine which of the common New Zealand insects are concerned in the transmission of potato leaf roll. Those used in the tests were *Myzus persicae*, *M. pseudosolani*, *Macrosiphum gei*, *Erythroneura zealandica*, *Thrips tabaci*, and *Melanophthalma gibbosa*, of

which only the first-named transmitted the disease (in 60 per cent. of the transferences made) [cf. *R.A.M.*, xi, p. 200].

MAGEE (C. J.). **Virus diseases of Potatoes. Control methods for tableland growers.**—*Agric. Gaz. New South Wales*, xlii, 11, pp. 839–841, 1 fig., 1931.

In this brief, popular note the author gives some recommendations for the establishment of stud plots for the production of potato seed tubers free from virus diseases [cf. *R.A.M.*, ix, p. 332 ; x, p. 681]. Especial stress is laid on the necessity of a careful selection of the seed tubers, which should be sprouted in the dark, so as to eliminate all tubers producing weak, elongated shoots.

ADAM (D. B.). **Degeneration of Potatoes. Virus diseases and their control.**—*Journ. Dept. Agric. Victoria*, xxx, 1, pp. 7–11, 5 figs., 1932.

In this popular note the author briefly discusses the facts supporting the view that 'degeneration' in potato stocks is due to virus diseases, and broadly indicates the lines on which such diseases may be controlled, with particular reference to the establishment of special stations in districts comparatively free from insect vectors for breeding disease-free stocks [see preceding abstract].

MARX (T.) & MERKENSCHLAGER (F.). **Zur Biologie der Kartoffel. 12. Mitteilung. Beobachtungen und Untersuchungen über den Verlauf des Kartoffelabbaues.** [On the biology of the Potato. Note 12. Observations and investigations on the course of Potato degeneration.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xix, 5, pp. 413–492, 15 figs., 2 diags., 3 graphs, 2 maps, 1932.

The present contribution to the biology of the potato consists of an exhaustive discussion, supplemented by fully tabulated chemical analyses and statistical data, on the course of 'ecological' degeneration on different types of soil at Dahlem, Berlin [*R.A.M.*, x, p. 748]. The writers were assisted in the work by O. Schwarz, A. Hey, and M. Klinkowski.

The Industrie variety on the so-called 'Dahlem degeneration soil' is liable to develop symptoms formerly known by the name of 'raspberry disease' [cf. ibid., vii, p. 662], but for which the term 'gooseflesh', suggested by Dr. Köhler, is now preferred. Affected plants present a 'cowering' aspect, the leaf blades being drawn downwards at the tip and of an abnormal shade of green, possibly due to irregular distribution of the chlorophyll grains, while the internodes are shortened. Some plants supplied by Prof. K. O. Müller showed a spoon-shaped, drooping foliage (with downward curling of the leaf blades) together with the pathological turgor and incapacity for normal wilting associated with leaf roll. For this phenomenon the name of 'spoon disease' is proposed.

Studies on the biochemistry of 'degenerate' tubers indicated that the co-operative working of the enzymatic system as a whole

is superseded in the diseases under discussion by an unchecked functioning of the single parts, e.g., the formation of melanin by tyrosinase [ibid., viii, p. 598] and of sugar by diastase.

MUSKETT (A. E.) & CAIRNS (H.). **The control of ordinary or late blight of the Potato in Northern Ireland. I. Spraying versus dusting—further experiments.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 117–123, 2 figs., 1 plan, 1931.

In further investigations conducted in Northern Ireland in 1930 on the control of potato blight (*Phytophthora infestans*) by various fungicides [*R.A.M.*, viii, p. 736] the efficacy of four proprietary dusts and one spray fluid was compared with that of Burgundy mixture.

'Cuprite' [ibid., x, p. 371], a British made dust stated to contain 16 per cent. metallic copper, was applied with a Torpille double action powder spraying machine (1930 model) at the maximum amount recommended, viz., 20 lb. per acre. A second dust, 'copper hydrate,' stated to contain 20 per cent. metallic copper was applied by means of the same machine, but as the maximum amount recommended, 12½ lb. per acre, was too small to be applied with accuracy, 16 lb. were used, this being the least quantity which could conveniently be applied to an acre. The two remaining dusts used were the American made Niagara copper and lime dusts, D 6 and D 25, of which the former, containing the lesser amount of copper, was stated to be suitable for ordinary conditions, while the latter was intended for use during severe infection. Both were applied with a Niagara blower gun operated by hand, the first treatment being given at the rate of 25 lb. per acre, and the second and third applications at 30 lb. The British made concentrated copper spray fluid, 'bouisol' [ibid., xi, p. 194] had the properties of a colloidal Bordeaux mixture; it was applied with a Vermorel knapsack sprayer at the strength recommended, viz., 1 in 100, and at the rate of 120 galls. per acre. The Burgundy mixture was used at the 4–5–40 strength for the first application and at 8–10–40 for the remaining two applications and was applied by means of a Vermorel knapsack sprayer at the rate of 120 galls. per acre. Each plot was sprayed or dusted three times, on 8th or 9th and 29th or 30th July and on 11th August.

By 18th August, the haulms in the control plots were almost completely killed, those in the dusted plots were nearly as bad, those in the bouisol-sprayed plot were slightly better and those in the plot sprayed with Burgundy mixture were still quite green. Ten days later, the haulms in the control and dusted plots were dead, those in the plot sprayed with bouisol were not quite dead, and those which had received the Burgundy mixture were still green, but ripening off. Finally, the Burgundy mixture gave an increased yield over the control of nearly 2 tons per acre, bouisol an increase of nearly 1½ tons per acre, the copper hydrate about 19 cwt., D 25 13 cwt., cuprite 3 cwt., and D 6 1 cwt.

The cost of the materials necessary to prepare sufficient Burgundy mixture to spray one acre three times was 15*s.*, as compared with 30*s.* to 42*s.* 6*d.* (according to the brand purchased) for sufficient of any one of the dusts for the same purpose.

PITTMAN (H. A.). **Potato diseases in Western Australia. The Rhizoctonia disease and common scab.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., viii, 4, pp. 463–476, 7 figs., 1931.

This is a slightly expanded version of the author's previous account of the potato diseases recorded in Western Australia [*R.A.M.*, viii, p. 804], with special reference to the etiology and control of *Rhizoctonia* scab (*Corticium solani*) and common scab (*Actinomyces scabies*). Of interest is the statement that, according to official statistical data, the average yield of potato crops in Western Australia during the period from 1920 to 1930 was only 3·8 tons per acre; this low yield is attributed in a large measure to the prevalence in the seed tubers used by the growers of various diseases, a view which is supported by the fact that growers using Government-certified seed have obtained yields averaging from 8 to 10 tons and, in one case, reaching as much as 23 tons 7 cwt. per acre.

SMITH (F. E. V.). **The leaf diseases of Irish Potatoes in Jamaica.**—*Journ. Jamaica Agric. Soc.*, xxxv, 11, pp. 489–494, 1 pl. 1931.

This is a brief, popular account of the two leaf diseases which are stated to attack potatoes in Jamaica, namely, early blight (*Macrosporium* [*Alternaria*] *solani*), and late blight (*Phytophthora infestans*), and also of their control by means of cupric sprays, the preparation of which is briefly described.

REDDICK (D.). **Some diseases of wild Potatoes in Mexico.**—Abs. in *Phytopath.*, xxii, 1, p. 22, 1932.

Blight (*Phytophthora infestans*) was observed on *Solanum verrucosum* from the State of Morelos, Mexico [*R.A.M.*, x, p. 814]. *S. demissum* is heavily infected by rust (*Puccinia pittieriana*) [ibid., x, p. 491] at El Desierto in the Federal District. An obscure disease known as 'spot' is prevalent on several tuber-bearing species of *Solanum*.

ITO (S.) & NAGAI (M.). **On the rot-disease of the seeds and seedlings of Rice-plant caused by some aquatic fungi.**—*Journ. Fac. Agric. Hokkaido Imper. Univ.*, xxxii, 2, pp. 45–69, 4 pl., 1931.

An account is given of the writers' studies on the following fungi associated with a destructive rot of rice seeds and seedlings growing in the seed-beds in Japan: *Achlya americana*, *A. flagellata* and its variety *yezoensis*, *A. oryzae*, *Dictyuchus sterile*, *Pythiomorpha miyabeana* n. sp., and *P. oryzae* n. sp. *A. prolifera*, previously reported as an agent of decay in rice seedlings in Japan [*R.A.M.*, vii, p. 535], was not obtained in the course of the present investigations. The fungi, which were isolated from water, muddy soil, vegetable and fish manure, dead insects and earthworms, as well as from infected seeds and plants, produce very similar microscopic symptoms, forming thick, white hyphae or a cottony mass at the collar of the plumules or on the surface of the grain.

P. miyabeana is characterized by somewhat swollen hyphae, 2·5 to 4·8 μ, mostly 3 to 3·5 μ in width; lemon-shaped sporangia, 36 to 53 by 17 to 36 μ, mostly 46 to 48 by 24 to 29 μ; ellipsoidal zoospores, 8·5 to 9·5 in diameter; globular, dark yellow oogonia, 28 to 50·5 μ in diameter with a smooth, thin wall 1·8 μ thick, containing smooth, globular oospores 24 to 36 μ in diameter; clavate or oblong antheridia, attached by the apices to the oogonial wall; and globular or irregular, intercalary gemmae, nearly equal to the oogonia in size.

P. oryzae may be recognized by its swollen hyphae 3·5 to 11 μ, mostly 6 to 8 μ in width; ovoid, ellipsoidal, or elongated sporangia, 41 to 84 by 26 to 48 μ, mostly 60 to 84 by 29 to 43 μ; ellipsoidal or reniform zoospores, 12 by 7 μ; and globular or irregular, intercalary gemmae; oogonia and antheridia were not found.

The optimum temperature for the growth on cereal agar of the above-mentioned species was found to be 26° to 28° C., except *A. oryzae* which developed best at 32° to 33°. The results [which are tabulated and discussed] of inoculation experiments showed that, generally speaking, a higher percentage of infection follows the combined attack of *P. oryzae* or *P. miyabeana* with one of the other rice pathogens than where the latter occur singly. *D. sterile* in particular proved to be a weak parasite. All the fungi invaded hulled rice grains more readily than dehulled ones.

Ito (S.) & Kimura (J.). **Studies on the 'bakanae' disease of the Rice-plant.**—*Hokkaido Agric. Exper. Stat. Rept.* 27, 99 pp., 2 pl. (1 col.), 1931. [Japanese, with English summary.]

In the Hokkaido district of Japan, where the writers' studies on the 'bakanae' disease of rice have been conducted for five years, the number of affected plants is stated frequently to reach 20 per cent. in the ordinary fields, while even in the well-cultivated plots at the Experiment Station 6,000 to 36,000 culms per acre may be attacked.

The diseased plants are tall, slender, and of a yellowish-green colour. When the affected seedlings were singly transplanted in the field, about 38 per cent. recovered before harvesting, 59 per cent. died, and 3 per cent. remained unchanged, showing the typical symptoms of the disease. Among the plants that succumbed, 51 per cent. died before the earing period. The infected plants were uniformly inferior to the healthy ones in the number of tillers, length of ears, number of grains per ear, and degree of maturity.

A species of *Fusarium* has consistently been isolated from the seedlings, culms, and grains affected by bakanae, the pale salmon-coloured sporodochia being especially visible along the suture line of the glumes. Inoculation experiments with this organism gave positive results only on rice and to a slight extent on maize, which developed a brownish discoloration of the culm base and made feeble growth, but without showing any of the typical bakanae symptoms. In Hokkaido the ascigerous form of the causal organism is produced on the affected culms in the autumn, and is freely formed in single ascospore cultures. The conidial stage was

erroneously identified with *F. heterosporium* Nees by S. Hori in 1898, and the ascigerous stage named *Lisea fujikuroi* by Sawada in 1917. In the senior author's opinion, however, the fungus is identical with, or possibly a variant of, *Gibberella moniliformis* (Sheldon) Wineland [described in 1924: ibid., iv, p. 162], having the microconidia in chains or false heads, the macroconidia mostly triseptate, no chlamydospores, and the ascospores uni-, rarely bi- or triseptate. In any case, the name *L. fujikuroi* cannot be accepted since *Lisea*, according to Wollenweber, is merely a section of *Gibberella*. Pending the results of further studies (now in progress), the name *G. fujikuroi* (Sawada) S. Ito n. comb. is proposed [but see also *G. fujikuroi* (Saw.) Wr.: ibid., x, p. 626; xi, p. 332].

The conidia germinated readily in water in five to six hours at 25° C., producing secondary conidia on the hyphae after one day. The ascospores also germinated in water in three to five hours at 25° to 26° and produced conidia after one day. Conidia were formed in profusion on various cultural media. On potato decoction and straw decoction agars and on steamed straw, indigo-black sclerotia were produced but no perithecia. The minimum, optimum, and maximum temperatures for perithecial growth were determined as about 10°, 26°, and 30°. *G. fujikuroi* survived four hours' exposure to a temperature of 95° (dry heat), being destroyed only by the same period at 100°. Suspended in water at 55°, 57·5°, and 60°, the conidia were killed in 17·5, 12·5, and 2·5 minutes, respectively, the corresponding times for the hyphae being 20, 15, and 5 minutes. The bakanae fungus was further able to withstand a few hours' exposure to a temperature of −23°. The conidia were killed by immersion in 1 to 2 per cent. formalin or 0·1 per cent. corrosive sublimate; for practical purposes 30 minutes in 2 per cent. or one hour in 1 per cent. of the former preparation is recommended. The disease was also controlled by salt water treatment (1·08 sp. gr. for non-glutinous or 1·07 sp. gr. for glutinous seeds).

The filtrate of culture solutions of the fungus produced the characteristic symptoms of the disease on rice seedlings. The hyphae were found to remain viable after three years' desiccation in the laboratory, and also survived a winter's exposure in the open, but very few survived in or on the ground and none in farmyard manure. The conidia remained alive for two years or more under dry conditions indoors.

No direct correlation could be traced between density of sowing and the severity of the bakanae disease, which was found, however, to be promoted by the presence in the seed of hulled or injured grains. In Hokkaido these are often found in considerable numbers especially after motor threshing, and their elimination is important. Infection by *G. fujikuroi* was more prevalent in transplanted than in direct sown fields. Generally speaking, the non-glutinous rice varieties appear to be somewhat more susceptible to bakanae disease than glutinous ones. Among the local varieties, Shiroke, Akage No. 3, and Kairyo-mochi No. 1 are resistant, while Bozu, Bozu No. 5, Chinko-bozu, and Iburiwase are susceptible.

KUROSAWA (E.). **Effect of temperature and medium upon the overgrowth phenomenon of Rice seedlings caused by the excretion of the cultures of Lisea fujikuroi Saw.**—*Journ. Nat. Hist. Soc. Formosa*, xxix, pp. 159–181, 1931. [Abs. in *Japanese Journ. of Botany*, vi, 1, pp. (9)–(10), 1932.]

The filtrate of cultures of *Lisea* [*Gibberella*] *fujikuroi*, the causal organism of the 'bakanae' disease of rice [see preceding abstract], is known to induce abnormal growth in length of the seedlings in the same way as the fungus itself. In some cases, however, exactly the opposite effect was observed. It was found by experiments in various nutrient media at different temperatures that abnormal growth in length occurs between 20° and 35° C., the former being the optimum, while above 35° retardation sets in. The presence of potassium or calcium nitrate and dextrose in the medium is necessary to induce the latter phenomenon, while for the former acid potassium phosphate is required in addition to the other substances.

KURIBAYASHI (K.). **Über eine Methode, um die Tatsache nachzuweisen, ob Piricularia oryzae noch lebt oder nicht.** [On a method of determining whether *Piricularia oryzae* is still viable or not.]—*Journ. Plant. Protect.*, xvii, 11 pp., 1931. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 1, p. (9), 1932.]

On treatment with a mixture of 2 per cent. neutral red and methylene blue, living conidia of *Piricularia oryzae* [*R.A.M.*, ix, p. 556] stain deep red or orange, whereas the dead ones assume a dark green coloration within five minutes. This method can also be used for *Colletotrichum lindemuthianum*, *Cercospora beticola*, and *Lisea* [*Gibberella*] *fujikuroi* [see preceding abstract].

SAMPIETRO (G.). **Il brusone. Le ipotesi vecchie e le loro contraddizioni.** ['Brusone'. Old theories and their contradictions.]—*Giorn. di Risicolt.*, xxii, 1, pp. 1–13, 1932.

In this paper (which originally appeared in the French journal *Riz et Riziculture*, v, 3), the writer discusses at some length the various theories that have been advanced from time to time in explanation of the 'brusone' disease of rice [*R.A.M.*, xi, p. 262]. None of these hypotheses has proved tenable, and the sole means of eliminating the disease appears to lie in obtaining from India, China, Japan, Java, and other rice-growing countries varieties with a high degree of congenital immunity, crosses between which and the indigenous Italian strains should yield resistant progeny.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon, 1931.**—*Fourth Quart. Circ. for 1931, Rubber Res. Scheme (Ceylon)*, viii, 4, pp. 39–41, 1931.

On the great majority of the estates in the main low-country districts of Ceylon the most dangerous disease of *Hevea* rubber is *Fomes lignosus*, the next most important in mature areas being *Ustulina zonata*. In 1931, die-back was much in evidence on poor washed-out soils and resulted, almost invariably, primarily from lack of cultivation and of measures for the conservation of water

and surface soil. Many weakly parasitic fungi are unable to attack healthy twigs but can kill back shoots whose water or food content is reduced below a certain level.

Owing to unusually protracted wet weather during the south-west monsoon, secondary leaf fall due to *Phytophthora palmivora* was moderately severe in most districts. *Oidium* [*heveae*: *R.A.M.*, xi, p. 126] is firmly established in all districts, but only at mid-country elevations is the defoliation serious. Considerable damage was wrought by attacks of *P. palmivora* on the green shoots of nursery stock; attacks of this fungus on the woody portions of bud-shoots, causing a type of canker, were also reported.

Mildew leaf disease. Some observations.—*Malayan Tin and Rubber Journ.*, xx, 20, pp. 1233–1238, 1931.

In this paper a summary account is given of the appearance and spread of the *Hevea* rubber mildew (*Oidium heveae*) [see preceding abstract] in the eastern tropics. After a brief description of the biology of the fungus, the symptoms caused by it, and of its influence on the yield, a detailed discussion follows of the measures now in use for its control, all of which have already been noticed in this *Review* from time to time.

MURRAY (R. K. S.). **The influence of Oidium and sulphur dusting on yield and bark renewal.**—*Fourth Quart. Circ. for 1931, Rubber Res. Scheme (Ceylon)*, viii, 4, pp. 42–51, 2 graphs, 1931.

In this report an account is given of sulphur dusting experiments for the control of mildew of *Hevea* rubber (*Oidium* [*heveae*]) carried out in 1930 and 1931 on the Kandanuwara Estate, Ceylon [see preceding abstracts]; in 1931, the dusting was even more successful than in the previous season, defoliation by the disease being largely prevented. Figures are given of the monthly yields of the test fields calculated to a standard of 100 trees tapped 12 times per month.

Owing to the retention of the young foliage, the dusted field recovered its normal yield in March and April after the usual falling off which takes place at the time of the wintering of the trees in January and February, whereas in the undusted control field the yield was still further depressed in March by abnormal defoliation of the young shoots; during the last six months of the year, however, the control field gradually recovered in yield and foliage as the severity of the attack abated. In both years the dusting was discontinued in March, and during the next following months there was a severe secondary mildew attack on the mature leaflets, which, however, caused little actual defoliation, in the treated field.

From March to December, 1930, the total yield for 100 trees of the dusted field amounted to 377·5 lb., as compared with 327 lb. in the control, the corresponding figures for the same period a year later being 464 and 298·5. The dusting not only conferred lasting benefit on the well-being of the trees, but provoked an immediately favourable effect on the yield.

In 1931 the average yield per tree per tapping in the dusted field

increased over that obtained in 1930 by 0·06 oz., whereas the yield in the control field decreased by 0·11 oz., these figures amounting to a net increase of the dusted over the undusted field of 0·17 oz. per tree per tapping; in other words, in 1930 the yield of the dusted plot was 16 per cent. greater than that of the controls, whereas in 1931 it had risen to be 75 per cent. greater. In the former year the dusting was started too late and a total of only 53 lb. sulphur per acre was used, against 85 lb. in 1931.

A comparison of the estimated yield per acre of the dusted field (calculated from the plot yields and the known number of trees per acre) with the yields per acre in previous years (taken from the estate figures) demonstrated that the dusting had brought about a net increase of roughly 200 lb. per acre per annum.

The average thickness of 8 months' renewing bark was about 39 per cent. greater in the dusted than in the control field.

CORNER (E. J. H.). **The identity of the fungus causing wet-root rot of Rubber trees in Malaya.**—*Journ. Rubber Res. Inst. Malaya*, iii, 2, pp. 120–123, 2 pl., 1931.

The author states that careful comparison of material from the Kew Herbarium, the Buitenzorg Botanic Gardens, and from Malaya allowed him to confirm beyond doubt the identity of the fungus causing wet-root rot of *Hevea* rubber in Malaya with the 'roode wortelschimmel' (*Ganoderma pseudoferreum*) of Java [*R.A.M.*, ix, pp. 127, 740; xi, p. 72]. This fungus has been found as a parasite at the base of several large forest trees in Johore and Pahang, and on *Myristica*, *Pterocarpus*, and *Arenga saccharifera* in Singapore. The species is very close to *G. applanatum*, of which it may eventually prove to be a variety. The paper terminates with an English description of the fungus, based on the Malayan material seen by the author, which is stated to agree exactly with that of van Overeem and Steinmann.

NAPPER (R. P. N.). **A further note on the effects of fungicides on the viability of Hevea buds.**—*Journ. Rubber Res. Inst. Malaya*, iii, 2, pp. 114–119, 1931.

The experiments briefly described in this paper showed that *Hevea* rubber buds taken from clone Avros 50 are much more susceptible to injury from immersion in copper sulphate solutions than those of a local Ceylon clone known as G. 771. These results are considered to explain the fact that while in Ceylon the disinfection of *Hevea* rubber cuttings and budded stumps with copper sulphate was reported as safe, in Malaya it was shown to be unsatisfactory, inasmuch as it seriously injured or even killed the buds [*R.A.M.*, x, p. 686].

JONES (W.). **A new technique for obtaining oospores of the Hop downy mildew by inoculating cotyledons.**—*Science*, N.S., lxxv, 1934, p. 108, 1932.

Hop seeds were gathered from plants badly infected by downy mildew (*Pseudoperonospora humuli*) in the Fraser Valley, British Columbia [*R.A.M.*, ix, p. 677], in 1930, and sown in the laboratory in 1931. As the cotyledons and young primary leaves appeared,

they were inoculated, after moistening, by placing on them fragments of infected leaves from diseased 'basal spikes' [ibid., v, p. 639], and then covered with vials in order to maintain maximum humidity. The temperature remained fairly constant at 58° to 65° F. After six days the cotyledons showed signs of 'damping-off', and on teasing out the tissue, about 80 oospores, from 23 to 37 μ in diameter, were found in each cotyledon. When maximum humidity was not maintained, conidiophores bearing conidia were also produced. It is now possible to obtain abundant oospore material by inoculating hop seedling cotyledons in this manner and gathering them on the first signs of damping-off. Conidia for experimental use in the greenhouse during the winter may also be obtained by the method herein described.

ASHBY (S. F.). **Quarantine and the spread of Sugar-Cane diseases.**—*Rept. Proc. Imper. Sugar-Cane Res. Conf., London, 1931*, pp. 146–151, London, Empire Marketing Board, 1932.

Notes are given on the present known distribution of the six major sugar-cane diseases, viz., mosaic [*R.A.M.*, xi, p. 265], Fiji disease [ibid., xi, p. 327], sereh [ibid., x, p. 299], gumming (*Bacterium vascularum*), leaf scald (*Bact. albilineans*), and leaf stripe (*Sclerospora sacchari*) [ibid., x, p. 690]. A brief discussion is given of the problem of latent or dormant infection, together with an account of modern methods of quarantine and a statement concerning the introduction of true seed.

ROLDAN (E. F.). **Pokkah-boeng, a disease of Sugar-Cane found on a Java Cane variety in the Philippine Islands.**—*Philipp. Agric.*, xx, 8, pp. 526–529, 2 figs., 1932.

On a recent visit to Del Carmen, Pampanga, infection with pokkah-boeng was again found on the P.O.J. 2878 sugar-cane variety [*R.A.M.*, xi, pp. 203, 266, 327], and it is feared that the disease [the symptoms and history of which are briefly described] may gain a foothold in the Islands unless prompt measures for its suppression are adopted. A species of *Fusarium* was consistently isolated from diseased canes and studies are in progress to determine its relationship with *F. moniliforme* [*Gibberella moniliformis*].

KARLING (J. S.). **Studies in the Chytridiales VII. The organization of the Chytrid thallus.**—*Amer. Journ. of Botany*, xix, 1, pp. 41–74, 21 figs., 1932.

In this study the writer discusses the distinguishing features of the thallus in the Rhizidiaceae, Myxochytridineae, and Cladochytriaceae.

The rhizoids of the family Rhizidiaceae are in general distinguishable from the mycelium of the higher fungi by their decrease in diameter from the point of origin and tapering to fine tips without any tendency to form new centres for the processes of growth, differentiation, and reduction. The thallus in the Cladochytriaceae is designated as a rhizomycelium to distinguish it from the mycelium of the higher fungi and the rhizoidal system of the Rhizidiaceae. In the genera *Physoderma* and *Urophlyctis*, and to some

extent in *Cladochytrium*, the turbinate organs or 'collecting cells' appear to be the centres of reduplication, from which the thallus spreads in the host tissue. At maturity, numerous centres of growth and differentiation arise in the form of sporangia and resting spores, with the result that the thallus becomes a polygenocentric system, in contrast to the monogenocentric thallus of the Rhizidiaceae.

A bibliography of 64 titles is appended.

ARNAUD (G.). **Les Astérinées. VII.** [The Asterineae. VII.]—*Ann. de Cryptog. exot.*, iv, 2, pp. 74–97, 6 pl., 1931.

In this paper the author gives a general review of the classification of the Asterineae in the broad sense, as employed by him in his previous communications [*R.A.M.*, x, p. 753 *et passim*]. This is followed by a description and discussion of several species belonging to this group of fungi from the Hawaiian Islands.

VAN BEYMA THOE KINGMA (F. H.). **Untersuchungen über Russtau.** [Investigations on sooty moulds.]—*Verh. Koninkl. Akad. Wetensch. Amsterdam*, Sect. 2, xxix, 2, pp. 1–29, 4 pl., 1931.

The present investigations on the sooty moulds were restricted to the study in culture of some imperfect forms, including *Caldariomyces fumago* Woronichin (*Fumago vagans* Pers.), which produced stalked and sessile pycnidia containing immense numbers of hyaline, elongated-spherical to oval, continuous pycnospores of very variable dimensions (mainly 4 to 11 by 2·3 to 5·3 μ), with 1 to 3 or more large oil drops. Conidia are not formed.

Two sooty moulds of tea from Java [*R.A.M.*, x, p. 558] are named *Microxyphium purpuraefaciens* n. sp. and *M. theae* n. sp. In the cultures of these also no conidial forms were observed but only stalked or sessile pycnidia in dense fascicles, measuring 200 to 350 by 30 to 80 μ in the former species and 400 to 500 by 50 to 95 μ (stalked) or 44 to 104 by 32 to 66 μ (sessile) in the latter; the neck in *M. purpuraefaciens* measures 140 to 175 μ in length and in *M. theae* 225 to 375 by 13 to 20 μ. The hyaline, continuous, mostly biguttulate pycnospores of *M. purpuraefaciens* measure 3·7 to 4 by 2·3 to 2·7 μ (average 4 by 2·3 μ), while those of *M. theae* are elliptical or oval in the stalked pycnidia and measure 3 to 3·7 by 2 μ, and spherical in the sessile, measuring 2·3 to 2·7 μ in diameter.

A comparison is given between the three forms under discussion.

JACKSON (H. S.). **The rusts of South America based on the Holway collections. V.**—*Mycologia*, xxiii, 6, pp. 463–503, 1931.

Continuing his studies of South American rusts [*R.A.M.*, xi, p. 128] the author gives notes on 83 species (including one new genus, 24 new species, and 4 new combinations) which occur on 24 families of phanerogams, including representatives of the Euphorbiaceae, Vitaceae, Tiliaceae, Malvaceae, Cactaceae, and Umbelliferae. English diagnoses of the new species are appended.

CUMMINS (G. B.). **Phragmidium species of North America: differential teliospore and aecial characters.**—*Mycologia*, xxiii, 6, pp. 433–445, 1 pl., 1931.

A discussion is given of the differential characters shown by the teleuto- and aecidiospores of 19 North American species of *Phragmidium*, by means of which these fungi are divided into two sections, namely, *Earlea* including six species, and *Euphragmidium* with thirteen species. The paper also gives a key to these species, arranged by the three tribes of the Rosaceae on which they occur.

HIRATSUKA (N.). **Inoculation experiments with some heteroecious species of the Melampsoraceae in Japan.**—*Japanese Journ. of Botany*, vi, 1, pp. 1–33, 1932.

A detailed account, supplemented by 42 tables, is given of the writer's inoculation experiments, covering a period of eight years, with some heteroecious species of Melampsoraceae occurring in Japan [*R.A.M.*, vii, p. 405; ix, p. 205].

In tables 41 and 42 the results of the experimental data are completely summarized, separate columns being allotted to the rust, the material used as inoculum, the experimental host, the investigator, year of investigation, and the natural hosts of the aecidial, uredo, and teleuto stages.

CURZI (M.). **Alcuni casi di 'cancrena pedale' da 'Sclerotium' osservati in Italia.** [Some cases of 'foot canker' caused by '*Sclerotium*' observed in Italy.]—*Rendic. R. Accad. Lincei*, xiv, Ser. VI, 5–6, pp. 233–236, 1 fig., 1931.

In 1929, asters growing at Pisa were affected by a rot [the symptoms of which are described] extending from the roots to the collar and for a few centimetres along the stem above the surface of the ground. From the affected plants the author isolated a fungus which in culture developed an abundant aerial flocculent mycelium with numerous cream-coloured, later dark chestnut, smooth, globose sclerotia about 0·5 to 1·5 mm. in diameter. This organism agreed in all its morphological characters with *Sclerotium rolfsii*, corresponding not only to Saccardo's diagnosis but to most of the detailed descriptions published by American workers.

In certain [not specified] cultural conditions the perfect or *Corticium* stage developed [cf. *R.A.M.*, vi, p. 56; x, p. 344], characterized by densely intricate branched hyphae bearing at the extremity clavate basidia measuring 10 to 15 by 4 to 5 μ, with 2 to 4 sterigmata 4 to 5 μ long, and with smooth, oval, hyaline basidiospores measuring 5 to 7 by 2·5 to 3·75 μ. Miss Westerdijk having informed the author that Nakata's and Goto's organisms [loc. cit.] corresponded to *S. delphinii* rather than *S. rolfsii*, he considers that he is the first to have obtained the perfect stage of Saccardo's species.

Another strain of *Sclerotium* was noted by the author in May, 1930, causing a basal canker of the stems of potatoes near Rome. In culture growth was more rapid than was the case with the aster strain and the colonies were occasionally dendritic; aerial

mycelium was sometimes absent, sometimes abundant and loose; the sclerotia were larger than those of *S. rolfsii* from aster, varied in size, and sometimes had dark, depressed spots on the surface. The fungus had many of the characters of *S. rolfsii* and some (less marked and less constant) of those of *S. delphinii*. While it could be regarded as an intermediate strain between the two species, it was nearer to *S. rolfsii*, to which the author considers it should be referred.

In some cultures of the strain obtained from potato, hymenial plaques of *Corticium* developed, showing well-formed, mature fertile organs almost identical with, though slightly larger than, those of the strain isolated from aster.

BEALE (HELEN PURDY). **Specificity of the precipitin reaction in Tobacco mosaic disease.**—*Contrib. Boyce Thompson Inst.*, iii, 4, pp. 529–539, 1931.

Leaf extracts of Sudan grass (*Andropogon sorghum* var. *sudanensis*), *Hippeastrum equestre*, lily (*Lilium* spp.), and *Abutilon striatum* var. *thompsoni*, each affected by its respective mosaic disease, and of peach affected by yellows, were tested for their ability to precipitate the antiserum for tobacco mosaic virus, with negative results [*R.A.M.*, viii, p. 743; x, p. 563].

Nicotiana glutinosa, *N. rustica*, and *Martynia louisiana* were added to the list of hosts of tobacco mosaic virus previously tested with antiserum for the same virus in Turkish tobacco, with a view to determining the presence or absence of material reacting with the specific precipitins, with positive results in every case.

The viruses of ring spot and cucumber mosaic [ibid., xi, p. 344] were multiplied in Turkish tobacco, and leaf extracts of the affected plants were used in turn as antigens in precipitin tests with antiserum for tobacco mosaic virus extract of Turkish tobacco. A slight precipitation resulted in the tubes containing undiluted antiserum and virus extract such as occurs when juice from healthy tobacco is used with undiluted antiserum. No specific precipitate for virus extracts of tobacco affected by ring spot or cucumber mosaic was demonstrable.

The author's results are considered to favour the interpretation that the specific antigenic substance in the virus extract of tobacco mosaic is foreign antigenic material, possibly virus itself, rather than altered host protein.

VINSON (C. G.) & GILDEHAUS (E. J.). **Comparison of juices from diseased and healthy Tobacco plants.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The tobacco mosaic virus can be precipitated from the juice of diseased plants by the addition of a solution of lead acetate [*R.A.M.*, x, p. 761]. After washing the precipitate with a M/3 solution of primary potassium ortho-phosphate, the virus can be freed from the precipitate by means of a dilute solution of potassium hydrogen phosphate, the reaction of which is nearly neutral. Such a solution of the virus is very infectious and contains Kjeldahl nitrogen, which is absent from a solution of healthy plant juice.

VINSON (C. G.). **Decomposition of the safranin precipitate of mosaic virus of Tobacco.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The safranin precipitate of the tobacco mosaic virus [*R.A.M.*, viii, p. 407] has been satisfactorily decomposed by the addition of Lloyd's alkaloidal reagent. The mixture is agitated at intervals for about 30 minutes and then centrifuged at high speed. After the removal of the safranin the supernatant liquid is usually more highly infectious than the original juice from which the safranin precipitate is prepared.

WAUGH (J. G.) & VINSON (C. G.). **Particle size of the virus of Tobacco mosaic in purified solutions.**—Abs. in *Phytopath.*, xxii, 1, p. 29, 1932.

The results of preliminary experiments indicate that the radius of the tobacco mosaic virus particle in purified solutions is less than 5 $\mu\mu$ [cf. *R.A.M.*, xi, p. 256].

VALLEAU (W. D.). **Two seed-transmitted ring-spot diseases of Tobacco.**—Abs. in *Phytopath.*, xxii, 1, p. 28, 1932.

Both the green and yellow ring spots occurring on tobacco in Kentucky [*R.A.M.*, x, p. 411] have been found to be transmissible through the seed in percentages up to 15. Seedlings affected by yellow ring spot turn yellow soon after germination. Of 24,060 seedlings raised from plants affected by yellow ring spot, 1,175 or 4·9 per cent. showed positive infection a few days after germination. Seed transmission of green ring spot is difficult to detect except at low temperatures (50° to 65° F.), when the leaf margins of affected plants become chlorotic or necrotic. The flower parts of affected plants appear normal, but most of the pollen grains are rather small and sterile, a feature that may be useful for diagnostic purposes in the absence of other symptoms.

TISDALE (W. B.). **Development of strains of cigar wrapper Tobacco resistant to blackshank (Phytophthora nicotianae Breda de Haan).**—*Florida Agric. Exper. Stat. Bull.* 226, 45 pp., 12 figs., 1931.

Further trials have been conducted in Florida in the attempt to develop tobacco varieties resistant to black shank (*Phytophthora nicotianae*) [*R.A.M.*, ix, p. 211]. The blossoms were protected from cross-pollination by covering the inflorescence with a sulphite paper bag until the seed reached maturity. Seed from each self- or cross-pollinated plant was saved separately and planted the following season on a steam-sterilized bed. Seedlings from each lot were transplanted to thoroughly infested soil in adjacent rows. Seed of the best plants from the most resistant rows was again saved and the process repeated until a highly resistant strain was developed.

The P strain thus obtained is a resistant selection from Big Cuba, the main commercial variety of cigar wrapper tobacco grown under shade in Florida up to 1923. Resistant strains have been similarly developed from the Little Cuba, Dubek (Russia), and Santiago (Java). Number 1 is a new resistant strain arising from

a cross between a partially resistant strain of Big Cuba and the susceptible Connecticut Round Tip. The new resistant strain R was developed from a suspected cross between a resistant strain of Big Cuba and Connecticut Round Tip. Number 301 was developed from a cross between resistant Big Cuba and resistant Little Cuba. This strain has given satisfactory results in two years' tests on an extensive commercial scale. Number 94, which was developed from a cross between 301 and R, gives a very superior quality of cured leaf. The P, 301, and 94 strains have been released for commercial cultivation.

ADAM (D. B.). **Blue mould in Tobacco. Hints on its control.**—*Journ. Dept. Agric. Victoria*, xxix, 10, pp. 469–471 and 476, 3 figs., 1931.

This is a brief popular discussion of the sources of infection of tobacco seed-beds with the blue mould fungus [*Peronospora* sp.: *R.A.M.*, x, p. 492; xi, p. 76], and of the control measures against it, including the preparation and application of Bordeaux mixture.

KUNKEL (L. O.). **Local lesions in aucuba mosaic of Tomato.**—Abs. in *Phytopath.*, xxii, 1, p. 16, 1932.

Studies on aucuba or yellow mosaic of tomato material obtained from England [*R.A.M.*, x, p. 135; xi, p. 335] have shown that the virus of this disease produces necrotic local lesions in leaves of the following species and varieties of *Nicotiana*: *N. acuminata*, *N. alata*, *N. glutinosa*, *N. langsdorffii*, *N. rusbyi*, *N. rustica*, *N. suaveolens*, *N. sylvestris*, and the Adcock, Burley, and Little Oronoca varieties of *N. tabacum*. It produces chlorotic local lesions in the following species and varieties: *N. paniculata* and *N. tabacum* vars. *macrophylla*, *purpurea*, and Connecticut Seed Leaf. The aucuba mosaic virus further produces chlorotic local lesions in the leaves of 12 tomato varieties [which are enumerated], including Globe, John Baer, and Stirling Castle. The development of local lesions is associated with multiplication of the virus at the point of inoculation. Aucuba mosaic differs from ordinary tobacco mosaic in its capacity to produce local lesions in tomato and in certain species and varieties of *Nicotiana*.

ALEXANDER (L. J.), YOUNG (H. C.), & KIGER (C. M.). **The causes and control of damping-off of Tomato seedlings.**—*Ohio Agric. Exper. Stat. Bull.* 496, 38 pp., 6 figs., 3 graphs, 1931.

Pythium ultimum [*R.A.M.*, x, p. 569; xi, p. 330] and *Corticium vagum* var. *solani* [*C. solani*] have been found to cause serious damping-off of tomato seedlings in seed-beds in Ohio, the former organism being responsible for most of the damage. The symptoms produced by both fungi are similar, except that *C. solani* causes malformations of the cotyledons and a drier type of lesion than that due to *P. ultimum*. The latter was found, in the conditions tested, to be least destructive at a soil temperature of 30° C. in soil at 35 per cent. of its water-holding capacity and to cause most injury between 18° and 24° at 45 per cent. soil moisture. *C. solani* caused the greatest reduction of emergence at 24° and the highest percentage of damping-off at 27° to 30° with water-holding capaci-

ties above 35 per cent. Excellent control of the disease in sterilized soil artificially inoculated with *P. ultimum* and *C. solani* was given by the admixture of a dust prepared by absorbing 15 parts by weight of 40 per cent. commercial formaldehyde on 85 parts of a carrier consisting of 1 part of kaolin and 2 parts of diatomaceous earth, at the rate of 42 gm. per sq. ft. of soil 2½ to 3 inches deep. Immediately after treatment the seed was sown and the soil thoroughly watered.

NEWHALL (A. G.). **A greenhouse Tomato hybrid somewhat resistant to Cladosporium leaf mould.**—Abs. in *Phytopath.*, xxii, 1, pp. 20–21, 1932.

In crosses between the English tomato varieties, Satisfaction and Main Crop, which show considerable resistance to leaf mould (*Cladosporium*) [*fulvum*: *R.A.M.*, vii, p. 749] and the standard American varieties, Bonny Best, and a pink Marglobe (Marhio), susceptibility was dominant in the F_1 generation. Seedlings of the F_2 generation were inoculated and the susceptible ones discarded, while some of the resistant individuals were grown to maturity and yielded 5 to 12 lb. per plant. Some resistance to leaf mould in the greenhouse under New York conditions appears to have persisted in the F_3, F_4, and F_5 generations of these crosses.

La maladie et les ennemis des Ormes. [The disease and enemies of Elms.]—*Rev. zool. agric. et appl.* (Bordeaux), xxx, 3, pp. 41–47, 1931. [Abs. in *Rev. Appl. Entomol.*, Ser. A, xx, 1, pp. 46–47, 1932.]

Of the elm sap beetles associated with Dutch elm disease (*Graphium ulmi*), *Scolytus* (*Eccoptogaster*) *scolytus* [*R.A.M.*, xi, pp. 275, 337] has two generations annually, the adults appearing in May and the latter half of August. *S.* (*E.*) *multistriatus* has similar habits, but attacks the smaller branches. Dying trees should be cut down, and the bark immediately removed from the trunk and large branches and burnt, together with all the smaller branches. Elms defoliated by *Galerucella* (*Galeruca*) *luteola* are so weakened that they are particularly subject to attack by Scolytids, and hence to infection by *G. ulmi*. Collection of the adults and larvae is advised.

BUISMAN (CHRISTINE). **Ceratostomella ulmi, de geschlachtelijke vorm van Graphium ulmi Schwarz.** [*Ceratostomella ulmi*, the sexual stage of *Graphium ulmi* Schwarz.]—*Tijdschr. over Plantenziekten*, xxxviii, 1, pp. 1–5, 3 pl., 1932. [English summary.]

Graphium ulmi, the causal organism of the die-back of elms [see preceding abstract], has been found by the writer to consist of two heterothallic groups (+ and − strains). By growing both strains together on sterilized elm twigs it is possible to produce perithecia of the *Ceratostomella* type approximating to those of *C. pini* [*R.A.M.*, xi, p. 340] but differing from the latter in their longer necks. The perfect stage of *G. ulmi* is accordingly named *C. ulmi* n. sp. It was obtained from branches of elms artificially inoculated with two isolations of the fungus and also by growing

different pure cultures of the fungus together on sterilized elm twigs.

The perithecia, which have not yet been found in nature, are black, round, 105 to 135 μ (average 123 μ) in diameter, generally provided with a few scattered hairs; the necks are often slightly curved, 265 to 380 μ in length, 24 to 38 μ wide at the base, 10 to 16 μ at the top, where the hyphae composing the neck diverge to form a crown of some 24 septate cilia of variable length (usually 25 to 60 μ), sometimes swollen at the top. The asci are embedded in a slimy mass and disintegrate in water, so that accurate determination of their size and the number of ascospores is difficult. The ascospores (of which there are probably eight per ascus) are slightly curved, shaped like the segments of an orange, and measure 4·5 to 6 by 1·5 μ.

RANKIN (W. H.). **A new disease of Elm.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 79–82, 1931.

In the summer of 1931 about 10 per cent. of the total number of five- to ten-year-old dwarf Asiatic elm (*Ulmus pumila*) trees in a neglected nursery block near Geneva, New York, showed a conspicuous mottling of the leaves, the light green areas becoming more yellowish as the season advanced. In some cases the first leaves were more mottled than the later ones, while in others the apical leaves of the twigs became entirely yellow. Two Scotch elms (*U. glabra*) in the same block showed such pronounced distortion of the foliage that the trees were barely recognizable as elms. The leaves were ragged and streaked with light green dashes or long lines here and there. These symptoms are considered to be strongly suggestive of a virus disease, in which case this would be the first record of a disease of this class on shade trees. A similar condition is stated to have been observed on elms in the Hudson Valley and New Jersey.

EHRLICH (J.). **The occurrence in the United States of Cryptococcus fagi (Baer) Dougl., the insect factor in a menacing disease of Beech.**—*Journ. Arnold Arboretum*, xiii, 1, pp. 75–80, 1932.

The beech scale of Europe (*Cryptococcus fagi*), which has been spreading in eastern Canada for many years, has recently been found in large numbers on beeches in Massachusetts and Maine. In Nova Scotia, Faull observed that the beech trees which are dying in quantities were suffering from the attacks of [unspecified] fungi growing in the scale-infested bark [*R.A.M.*, ix, p. 421], but the fungi have not yet been found in the United States. Notes are given on the life-history and control of the insect, which does not seem to be a serious pest unless accompanied by fungi that gain entry through bark injured by the scale.

ASHCROFT (J. M.). **Canker of Black Walnut caused by a Nectria sp.**—Abs. in *Phytopath.*, xxii, 1, p. 3, 1932.

Black walnut [*Juglans nigra*] canker, associated with a species

of *Nectria* closely resembling *N. ditissima* [? *N. galligena*: *R.A.M.*, ix, p. 751], has been found in West Virginia, Pennsylvania, and Virginia, and reported from Rhode Island, Wisconsin, Tennessee, North Carolina, and Ontario. Out of 104 inoculations made with conidial suspensions of the fungus on the wounded bark of old and young black walnut trees, 79 per cent. were successful. The *Nectria* was repeatedly reisolated from the artificially induced cankers. The typical ringed aspect of the cankers is due to a seasonal alternation of dominance in the growth of the fungus and that of the host, the activity of the former being conspicuous in the late winter and early spring. All the regions of the trunk are liable to infection.

White (R. P.). **Four unusual symptomatic pictures and their diagnosis.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 82–86, 1931.

A brief, popular account is given of four unusual pathogenic conditions of trees in New Jersey. Two Norway maples (*Acer*) [*platanoides*] were attacked by *Armillaria mellea*, causing a reddish discoloration of the foliage and a water-soaked decay of the bark near the soil level. The same fungus has been found during 1931 killing *Buxus suffruticosa* and *Andromeda japonica* plants.

Another Norway maple showed an extensive development of fibrous roots growing upwards from the base of the trunk, instead of downwards, and thereby causing a loosening of the bark from the phloem. A slight slime flux was present near the affected area, but the primary cause of the condition is obscure.

A disease of Japanese maples [*A. palmatum*] at present undergoing investigation at the New Jersey Experiment Station is characterized by a silvery, shrunken appearance of single branches, which are killed by a species of *Phomopsis*. The underlying wood is dead and of a uniform, light brown colour. Older cankered areas bear numerous minute black fruiting bodies. Infection on young twigs occurs generally early in the winter, near the base of a dormant bud, whence the fungus spreads rapidly down the twigs into the larger branches. Successful inoculations were readily obtained with pure cultures of the fungus.

Another maple was primarily infected by wilt [*Verticillium*: *R.A.M.*, viii, p. 424] and showed further symptoms due to the presence of secondary organisms.

Lindeijer (Egbertha J.). **Een bacterie-ziekte van de Wilg (II).** [A bacterial disease of the Willow (II).]—*Tijdschr. over Plantenziekten*, xxxviii, 1, pp. 9–11, 1 pl., 1932.

A brief account is given of the writer's observations on the transmission of the Dutch bacterial disease of willows [believed to be similar to that attributed in England to *Bacterium salicis*: *R.A.M.*, x, p. 568] by the poplar and willow borer (*Cryptorrhynchus lapathi*) [ibid., xi, p. 274]. The insects feed for a time on the diseased wood and then pass on to healthy branches, in which they bore holes penetrating to the wood.

SCARAMELLA (PIERA). **Sullo svernamento delle Melampsorae dei Salici in alta montagna.** [On the overwintering of the *Melampsorae* on *Salix* in high altitudes.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxviii, 3, pp. 538–540, 1931.

Willows at all altitudes in the Alps are commonly infected by species of *Melampsora* which cause a serious defoliation and a dying back of the young branches in certain species, such as *Salix herbacea* and *S. serpillifolia*, especially when growing in damp localities. The author observed the uredo stage of *M. arctica* on *S. retusa*; *M. reticulata* and *M. alpina* on *S. reticulata*; *M. euonymi caprearum* and *M. ribesii-salicum* on *S. caprea*; *M. ribesii-viminalis* on *S. viminalis*; and *M. ribesii-salicum* on *S. purpurea* and *S. grandifolia*.

During the exceptionally hot, dry summer of 1928 in and near the Alpine botanic garden Chanousia (2,000 to 2,800 m.) it was observed that *S. helvetica*, *S. herbacea*, *S. retusa*, and *S. serpillifolia* growing in the driest places remained apparently healthy, though they had been covered with uredosori in previous years, while those situated near water or in shady places were severely affected. When the apparently healthy willow branches were placed in water in the laboratory, the leaves rapidly became rusted, and the author found that in many branches from such apparently healthy willows a hyaline, intercellular mycelium extended from the epidermis to the pith. It is suggested that these rusts overwinter by means of a perennial mycelium in the branches, which may be prevented from developing further under hot, dry conditions. In confirmation of this view it is stated that apparently healthy willows 48 hours after being copiously watered developed marked infection whereas others in the vicinity remained unaffected. Also, 48 hours after a day's continuous rain every willow examined showed infected leaves, a similar observation being made in the Trentino in 1931 on *S. herbacea* and *S. serpillifolia*. Teleutospores were not observed in any of these cases.

WELCH (D. S.). **Some rusts of Junipers.**—*Seventh Nat. Shade Tree Conf., Proc. Ann. Meeting, August 27, 28, 29, 1931*, pp. 73–78, 1931.

A popular account is given of the symptoms and life-histories of the apple, hawthorn, and quince rusts caused, respectively, by *Gymnosporangium juniperi-virginianae*, *G. globosum*, and *G. germinale* in the United States [*R.A.M.*, x, p. 391]. The apple rust, which affects various wild species of *Pyrus* in addition to the cultivated apple, numbers among its alternative hosts *Juniperus virginiana*, *J. barbadensis*, *J. sabina*, and *J. scopulorum*. The alternative hosts of *G. globosum* are *J. virginiana* and *J. barbadensis*, and those of *G. germinale*, *J. communis*, *J. sibirica*, and *J. virginiana*. The use of fungicides for the control of these diseases is stated to be still in the experimental stage, and the removal of the alternate hosts has given more satisfactory results. A brief discussion of the paper follows (pp. 78–79).

MUSKETT (A. E.). **The control of diseases and weeds in a forest nursery.**—*Journ. Min. Agric. Northern Ireland*, iii, pp. 102–116, 1 diag., 1931.

This is an expanded account of a paper already noticed from another source [*R.A.M.*, ix, p. 72] describing the control by applications of sulphuric acid of the diseases of Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga taxifolia*) nursery seedlings caused in Northern Ireland by *Corticium solani* and a *Botrytis*.

GRAY (W. G.). **An instance of 'damping-off' retarded by the use of basic slag.**—*Forestry*, v, 2, pp. 132–135, 1931.

The author states that in the experimental plots of the Imperial Forestry Institute nursery at Kennington, Oxford, a serious damping-off of seedlings of five coniferous species of trees, caused by an unidentified species of *Fusarium*, was very considerably delayed and reduced in 1930 by the application before sowing of basic slag at the rate of 5·1 tons per acre.

CHRISTENSEN (C.). **Cultural races of Pestalozzia funerea and the production of variants resembling Monochaetia.**—Abs. in *Phytopath.*, xxii, 1, p. 6, 1932.

Fifteen races of *Pestalozzia funerea* [*R.A.M.*, xi, p. 159], differing from each other in cultural and morphological characters, were obtained by isolating 150 individual conidia from acervuli on long-leaf pine (*Pinus palustris*) needles. Ten variants, differing from their parents and from each other in the above characters, arose as sectors in cultures of the races isolated from pine needles. Races agreeing with the description of *Monochaetia* [cf. ibid., viii, p. 66] were obtained from conidia isolated from pine needles and also arose as variants in mono-conidial cultures that normally produced spores bearing 3 to 5 setae. Inoculation experiments on seven species of conifers with spores of the different races gave negative results.

CARTWRIGHT (K. ST. G.). **The toxicity of preservatives against wood-destroying fungi.**—*Forestry*, v, 2, pp. 138–147, 1931.

After a brief discussion of the advantages and drawbacks of the wood preservatives now in use, the author examines in some detail the various methods of testing these substances for their toxicity to wood-decaying fungi, and suggests that a feasible solution of the whole problem of timber preservation against such rots might be the discovery of a substance which, instead of being directly toxic to the fungi, would prevent their growth by inhibiting or neutralizing their reactions with the host, thus depriving them of food.

POPHAM (F. J.). **Some experiments on a new idea for wood preservation.**—*Indian Forester*, lvii, 11, pp. 545–546, 1931.

In experiments conducted at the Forestry Research Institute, Dehra Dun, India, it was found that timber preservatives could be divided into two classes, viz., (1) those passing into the cell walls and causing swelling (water-soluble salts, phenols, and alcohols),

and (2) those remaining in the cell spaces, represented by the neutral hydrocarbons, e.g., petroleum and creosote free from tar acids. With creosote containing over 20 per cent. tar acids, a measurable amount of the latter passed into the cell walls, and a system tar acid/cell wall and tar acid/creosote was formed. A similar equilibrium was established when neutral petroleum oils were substituted for creosote. Tar acids, though toxic to fungi and termites, readily leach out of the wood in the rains, so that a high proportion of them in creosote is not desirable.

Petroleum products are frequently stated to render wood waterproof, and three tests were accordingly made on mango (*Mangifera indica*) blocks to determine the preservative value of a mixture of tax acids and cheap paraffin wax residues. The wood was treated (1) with wax residue alone (setting point 55° C.); (2) with tar acids to saturation, followed by hot wax residues; and (3) with a mixture of tar acids and wax residues in equal proportions (setting point 38°). The treated samples were placed in cold water. Tar acids immediately began to leach out of samples (2) and (3), which sank in the water in three days, as also did sample (1). Samples (2) and (3) were placed in fresh water each day for 14 days, at the end of which period tar acids were still leaching out profusely. This method of treatment, therefore, appears to be of little value, and the tests further indicate that the waterproofing qualities of paraffins are inconsiderable.

FALCK (R.). **Ueber die Schutzbehandlung des frisch gefällten Buchennutzholzes.** [On the protective treatment of freshly felled Beech wood for structural purposes.]—*Der Deutsche Forstwirt*, xiv, 4, pp. 21–22, 1932.

Excellent control of the rotting of beech logs due to *Stereum* [? *purpureum*: *R.A.M.*, vii, p. 691] has been obtained by the writer in experiments at Hann.-Münden by the treatment of the freshly felled wood with a new commercial preparation known as xylamon, which is applied by means of a brush or simple spraying apparatus to cut surfaces and wounds. The present cost of xylamon is M. 80 per 100 kg.

FALCK (R.). **Ueber den Einfluss des Flössens auf die Widerstandsfähigkeit des Bauholzes gegen Trockenfäule und über den Holzschutz durch Schimmelbefall und Diffusionstränkung.** [On the influence of floating on the resistance of structural timber to dry rot and on the protection of wood by fungous infection and diffusion saturation.]—*Mitt. Forstwirtsch. und Forstwissensch., 1931*, pp. 480–485, 3 figs., 1931.

The writer states that the well-known fact that structural timber that has become waterlogged by floating in water during its transport is less liable to decay from dry rot [*Merulius lacrymans*], *Coniophora* [*cerebella*], and the like [*R.A.M.*, ix, p. 216], is due in part to heavy infection of such wood by *Trichoderma lignorum* and *T. viridis*, the enzymes of which are poisonous to wood-destroying fungi while they themselves cause little injury. His experiments have shown that such *Trichoderma*-infested wood is resistant to the attack of *C. cerebella*. In order to ensure complete and permanent

protection from the latter, however, the 'floated' wood should be treated before it dries out with injections of water-soluble preservatives, e.g., sodium fluoride, sodium arsenate, or sodium dinitrophenol, which readily diffuse throughout the damp wood. This mode of impregnation has been found greatly superior to the surface treatment of the dry wood.

GIBBS (J. G.). **Experiments with lime on club-root control.**—*New Zealand Journ. of Sci. and Techn.*, xiii, 2, pp. 104–119, 7 figs., 10 graphs, 1931.

Previous attempts at the control of finger-and-toe disease of crucifers (*Plasmodiophora brassicae*) in New Zealand have been unsuccessful, but recent work [cf. *R.A.M.*, x, p. 574] indicates that practical control may be obtained by applications of comparatively small quantities of lime (2 tons air-slaked per acre) three months before sowing (reduction of infection from 80 to 4 per cent.). In another trial the amount of finger-and-toe was reduced from 65 to 5 per cent. by dressings of air-slaked or burnt lime given twelve months before sowing. This treatment must be combined with the application of a strongly basic fertilizer, preferably basic slag, when drilling.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 1, pp. 10, 15–17, 22–25, 30–37, 1932.

GERMANY (Oldenburg). An Order dated 10th October, 1931, prescribes similar measures for the control of the elm disease caused by *Graphium ulmi* in Oldenburg to those already in force in other parts of the Republic [cf. *R.A.M.*, xi, pp. 208, 272].

ARGENTINE REPUBLIC. By virtue of a Decree dated 9th March, 1931, all consignments of fresh fruit imported into the Argentine Republic must be accompanied by a duly authenticated health certificate. In no case, however, will consignments of fruit infected by any of the following parasites be admitted: *Phyllosticta solitaria* [apple], *Bacterium* [*Pseudomonas*] *citri* and *Pythiacystis* [*Phytophthora*] *citrophthora* [citrus], and *Thielaviopsis* [*Ceratostomella*] *paradoxa* [bananas, pineapple, &c.]. The diseased fruit will be destroyed at the importer's expense and no claims for compensation will be allowed.

BRAZIL. As from 13th November, 1931, all living plants or parts thereof imported into Brazil must be accompanied by an official health certificate stamped by a Brazilian consul. Special declarations are further necessary in certain cases, e.g., potatoes must be accompanied by a certificate vouching for their origin in a locality free from wart disease (*Synchytrium endobioticum*) and powdery scab (*Spongospora subterranea*).

AUSTRIA. The text is cited of an Order of 24th October, 1931, defining the duties of all landholders or occupiers in the protection of their crops and other plants against diseases and pests and giving considerable powers to the authorities to obtain specimens of such plants and to prescribe, under advice, the remedial measures to be taken in the case of outbreaks of serious diseases. Such diseases may be proclaimed after consultation with the agricultural or

forestry associations and the plant protection institute in Vienna, and a subsequent order, of 24th November, 1931, specifies as destructive diseases the black rot of the vine [*Guignardia bidwellii*] and the die-back of elms [*Graphium ulmi*]. Measures against certain other diseases are prescribed in this second Order as well as regulations for the preservation of the health of plants in nurseries and other commercial plantations.

Phony Peach-disease quarantine. Quarantine No. 67. Revision of quarantine and regulations.—*U.S. Dept. of Agric., Plant Quarantine and Control Admin. Leaflet*, 7 pp., 1 map, 1931.

The present revision of the phony peach disease quarantine (No. 67) [*R.A.M.*, ix, p. 416] prohibits the inter-State shipment, without a special Federal permit, of peach trees and roots, nectarine trees and roots, or other kinds of trees or shrubs grafted or budded on peach or nectarine roots, from a regulated area to any outside point or from a regulated area of one quarantined State to any other quarantined State. The regulated areas cover the entire States of Alabama, Georgia, Louisiana, Mississippi, and South Carolina, and parts of Arkansas, Florida, Illinois, North Carolina, Tennessee, and Texas. The conditions governing the issuance of permits for the inter-State movement of the above-mentioned stock are defined.

Bananas in New South Wales.—*Fruit World of Australasia*, xxxii, 9, p. 540, 1931.

Banana heart-rot (infectious chlorosis) [*R.A.M.*, x, p. 472] has been proclaimed a disease under the New South Wales Plants' Diseases Act [1924].

Verboed van invoer van geinfecteerde Cacaoboonen in Amerika. [Prohibition of import of infected Cacao beans into America.] —*De Bergcultures*, v, 47, pp. 1324, 1327–1328, 1931.

The Dutch *chargé d'affaires* in Washington has notified the Governor-General of the Dutch East Indies and the Governor of Surinam of changes in the regulations governing the importation of cacao beans into the United States. Under section 7 of the Federal Food and Drugs Act, as from 1st April, 1932, shipments of cacao beans containing more than 10 per cent. of mould [*R.A.M.*, xi, p. 30] or worm infection, or both, will be detained. It is expected that between this date and 1st October, 1933, when the regulations will be made still more stringent, adequate steps shall be taken to control these defects. On and after the latter date, shipment of cacao beans containing over 10 per cent. mould and worm infection, not more than half of which shall be mouldy, will be considered to be adulterated and detained in consequence.

[An English version of this notification is given.]